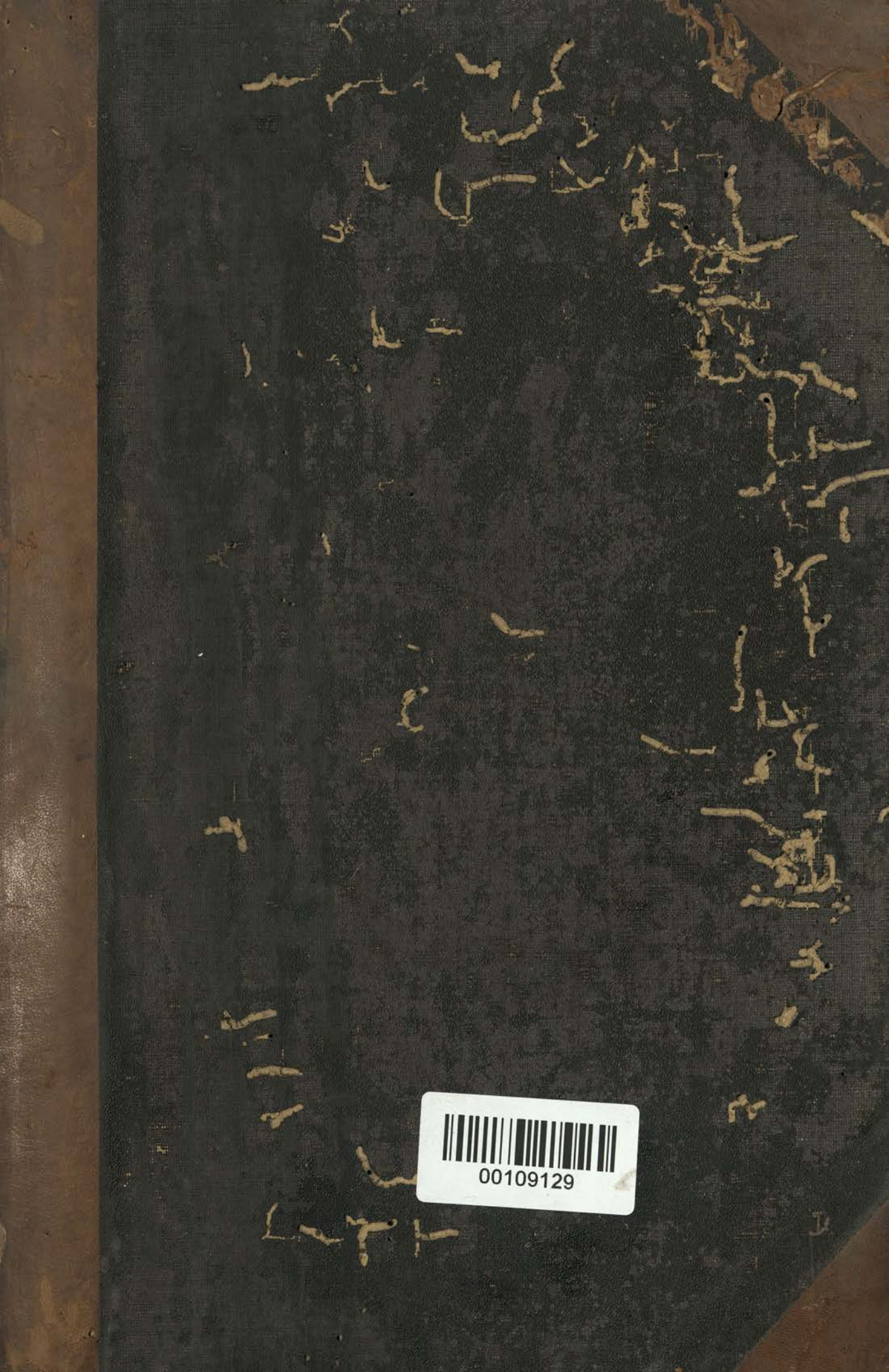
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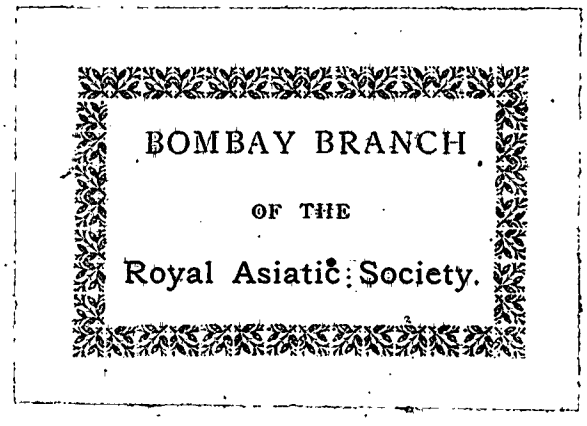

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EAST INDIA (DELHI).

FIRST REPORT

OF THE

DELHI TOWN PLANNING COMMITTEE

ON THE

CHOICE OF A SITE FOR THE NEW IMPERIAL CAPITAL.

109129

WITH TWO MAPS.

Presented to both Houses of Parliament by Command of His Majesty.

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To

HIS EXCELLENCY THE VICEROY
AND GOVERNOR-GENERAL OF INDIA.

June 13th, 1912.

YOUR EXCELLENCY,

I have the honour to present the report of the Delhi Town-planning Committee on the choice of a site for the new Imperial Capital.

I have the honour to be,

Your Excellency's obedient servant,

GEORGE S. C. SWINTON, *Captain,*

Chairman, The Delhi Committee.

Report of the Delhi Town-planning Committee on the choice of a Site for the new Imperial Capital at Delhi.

1. *The scope of the present report.*—In accordance with the wishes of His Excellency the Viceroy the Committee have treated the question of the choice of a site for the new Imperial City and Cantonment to be located at Delhi as a separate subject. The present report of the Committee accordingly deals only with the selection of a site and contains no recommendations on the subject of town-planning in regard to which the Committee will present a separate report at a later stage.

2. *Considerations governing the choice of a site.*—The Committee received instructions that in the matter of a site their choice was to be entirely unrestricted. The stones laid by Their Imperial Majesties were to be treated by them as commemorating a momentous change and were not to tie them of necessity to any particular locality. The important point was that the new site must be Delhi—that is an area in close physical and general association with the present city of Delhi and the Delhis of the past.

Apart from the question of locality, in dealing with the choice of a site the Committee have felt that the following considerations were paramount and must receive the closest and most continual attention :—

(*a*) Health and sanitation.

(*b*) Water-supply and irrigation supply.

(*c*) The provision of ample room for expansion.

(*d*) An extent of land suitable for the location of buildings of various characters and sizes, and for the provision of spacious parks and recreation grounds :—To be assumed at 10 square miles for the new city and 15 square miles for the Cantonment.

(*e*) Cost of land and the cost of executing necessary works on different sites.

(*f*) Facility for external and internal communication.

(*g*) Civil and Military requirements.

Other points arose and received due weight and consideration; but the points enumerated above were considered to be the chief in importance.

3. *Proceedings of the Committee.*—The Committee arrived in Bombay on April 12th. The next two days were spent in seeing Bombay city and its municipal arrangements, the Bombay Improvement Trust properties and the projects for town-planning and extensions near Salsette.

Delhi was reached on April 15th. The following five weeks were spent in Delhi with the exception of a short visit to Jaipur, where the Committee had the advantage of being shown over the city of Jaipur and its buildings by Colonel Sir Swinton Jacob prior to his departure for Europe, and an expedition to Agra. During this period all the suitable ground within a 10 mile radius of Delhi city was carefully inspected and examined, and the information collected by the special staff attached to the Committee regarding survey, water-supply, drainage, subsoil water, soil, geology, climate, sanitation, health and prices of land was studied and discussed on the spot.

The Committee were shown over Indian houses in Delhi city by Indian gentlemen, and had the advantage of studying the working of the canals, railway systems and conservancy and water-supply arrangements serving the present city of Delhi at first hand, with the assistance of the local officers in charge of these branches of administration.

On the 20th of May the Committee came to Simla in order that they might consult with the various officers of the Government of India regarding essential provision to be made in the choice and development of a site for the new Imperial Capital and Cantonment.

4. *A general description of Delhi and its environs.*—The town of Delhi is situated on the western bank of the Jumna river, practically half way down a narrow strip of country, some 76 miles in length, which forms the administrative district of Delhi. In the Census of 1911 the population of Delhi city was recorded as 232,837 people, of whom half live inside the walled city, and the other half occupy the civil station, on the north, between the city and the Ridge and the irregular suburbs, to the west and south, known by the names of Sabzi Mandi, Sadar Bazar and Paharganj.

The country in the environs of Delhi city falls into four natural divisions, the Delhi hills, the Jumna riverain, the slopes of the hills to the south of Delhi, and the table-land irrigated by the Western Jumna Canal.

The *Delhi hills* consist of a low eminence of quartzite rocks, starting from the village of Wazirabad on the river Jumna, passing to the west of the city walls and pursuing a course with a general direction to the south-west. At the outset the ridge is narrow in character with restricted skirts attaining a maximum height of only 775 feet above sea level close to the Mutiny Memorial. The Ridge disappears at the point of junction between the suburbs of Sabzi Mandi and Sadar Bazar. To the south-west of the latter suburb the Ridge rises again, broadens out and continues to hold an almost uniformly broad course to the south-west until in the vicinity of the Kutb it divides into two portions, one sweeping in a broad curve to the south-east and the other continuing a southerly course. The highest points in this portion of the Ridge are 865 feet to the west of the garden known as Thal Katora, 825 feet to the west of the village of Aragpur Bagh Mochi, and 915 feet above Mahrauli. The general character is the same throughout—a rugged surface of flat character offering a somewhat uniform sky line with scanty vegetation in occasional pockets of soil. To the south of Delhi, on the west side, considerable outcrops flank and rejoin the main ridge, leaving triangular valleys in the interspaces.

The Jumna Riverain.—The Jumna has the usual characteristic of the rivers of the plains of Northern India, that is a wide sandy bed in a broad valley, subject to flooding and flanked by high banks at its edges. This valley may be generally described as the riverain.

At Delhi itself the sandy bed hugs the high bank formed by the eastern skirt of the Ridge and the high ground occupied by the Fort at Delhi, the riverain here being confined to the east bank only; further north above Wazirabad, the riverain on the west bank extends to the Grand Trunk Road near the village of Balsua Jehangirpur, a distance of about 4 miles. To the east, north of the railway bridge the stretch of the riverain is artificially bounded by the Eastern Jumna Canal and south of the bridge by the embanked training work of the Agra Canal. Opposite the latter on the west bank the riverain is narrow and skirts the Muttra Road.

The whole width of the river at the bridge is half a mile between abutments. The volume of the river varies with the season and greatly also during each season. In the cold weather the volume is ordinarily below 500 cubic feet per second and may fall to 100 cubic feet per second, while at times of winter rains there may be a rise to between 3,000 to 5,000 cubic feet per second. With the advent of the monsoon season normally the volume increases to from 5,000 to 10,000 cubic feet per second, and in ordinary flood the rise is to from 50,000 to 75,000 cubic feet per second. In years of exceptional floods, discharges of one lakh to $1\frac{1}{4}$ lakhs of cubic feet per second have been recorded. The river, as the Committee saw it, was a narrow ribbon of water in a wide sandy bed which becomes covered when a rise of 5,000 to 10,000 cubic feet per second occurs. In years of normal river the creeks intersecting the riverain are filled with water from July till September; but in times of exceptional flood the whole riverian becomes covered with river spill. The records available show that the Barari plain, on which the Durbar review ground and amphitheatre are situated, is liable in four monsoon seasons out of ten to be submerged completely in 5 feet of water. The duration of the flooding of the riverain area varies greatly with the character of the season and lasts from a few days to some weeks, rendering all the land in the Durbar area below the contour of 680 feet unsuitable for permanent occupation. Below the bridge the same conditions obtain in the riverain,

the contour falling with the river from 673 at the bridge to 662 at the Agra Canal weir at Okhla.

In addition to the water coming down the river in the monsoon period, the drainage of the country falls through the riverain into the river by the means of creeks whose flow is held back while the river is gorged with Himalayan flood water. An example of these creeks is the artificial cut known as the Najafgarh drain, which, after following the valley of the table-land, intersects the Durbar area and passes through the riverain in a direction contrary to the flow of the river into the Jumna. The blocking of such drainages by flood water accentuates the difficulty of finding suitable areas for permanent occupation in the neighbourhood of riverains.

The slopes of the hills to the south of Delhi.—On the east side the alluvial skirt of the slopes rises from the Jumna riverain in the vicinity of the Muttra road to the hills to the west and south. The centre of the basin formed by the arms of the hills is drained by the important cut which outfalls into the river near the village of Kilokri. The 700 foot contour is reached in the vicinity of the Kutb Road, and the skirt of alluvial soil extends to the hills on the average to a point touching the 750 foot contour. On the west side the alluvial slopes begin as a rule at the 775 foot contour, and fall away to the Najafgarh Jhil drain, which lies in the valley approximately on the 695 foot contour. The slope is broken by an isolated outcrop of rock at the village of Naraiana.

The table-land irrigated by the Western Jumna Canal.—This table-land lies to the north-west and west of Delhi. As far as the area under the observation of the Committee is concerned, it may be described as lying between the Southern Punjab Railway and the Grand Trunk Road. Adjoining Delhi this area is occupied by heavily irrigated gardens. Further north, in a local depression near Wazirpur, water-nuts, rice and sugarcane are grown. The rest of the plain is heavily cropped. The general slope is of one foot in a mile only, except in the immediate vicinity of the Najafgarh drain where it is steeper. The subsoil water in the Delhi gardens and the Wazirpur basin has been raised by abuse of surface irrigation to within 3 to 7 feet of the surface and is generally high throughout the area. In the Delhi gardens the soil is peculiarly retentive and water poured on the land by irrigation or collected after rain drains away slowly.

The climate of Delhi.—The average rainfall of Delhi is 27·52 inches for the period of 1878-1910. The bulk of the rain is received in the monsoon months. The largest fall of rain recorded in 24 hours amounted to 17 inches at Delhi itself in September 1875, while the smallest rainfall recorded for a year was 7·8 inches at Mahrauli 12 miles from Delhi in the year 1886-1887.

Indian tradition divides the seasons at Delhi into three, (*a*) the dry season, beginning on the 20th of February and ending on the 20th of June, (*b*) the wet season, beginning on the 20th June and ending on the 20th of October, and (*c*) the cold season, beginning on the 20th of October and ending on the 20th of February. During the first period the weather increases in heat and dryness and hot west winds should blow. In the second period monsoon winds and plentiful rain are expected, and the close of this season after the rains is unhealthy. In the third period the weather cools down, and the middle of the period is characterised by bleak north-west winds, the temperature dropping to as low as 47 degrees on the average, and occasionally to freezing point.

5. *Size of the site. The limited sites available for consideration.*—It will be seen from this description of Delhi and its environs that the field in which the Committee could look for a site was strictly limited by peculiar physical circumstances. The river, the flooded areas and the hills are all disconnecting factors which make the provision of a sufficiently large area of suitable land in one place, close to the city of Delhi, very difficult. The ground forming the approach to the present city was considerably cut up by artificial features such as the various railways entering at different points, the Western Jumna Canal and the Najafgarh drain. The fact that half the population of the town live outside the walls in irregularly developed suburbs rendered the work of co-ordinating the new Delhi in a balanced perspective with the present city a hard task.

The amount of land required limited the choice of ground. Fifteen square miles was needed by the Military authorities for a Cantonment which was to be placed in proximity to the Imperial City. The needs of the Imperial Capital itself, though not finally decided, had been estimated to cover 10 square miles, and, besides this, land for isolation zones and future development was needed which would vary with the precise location of the new town. In choosing a site the possibility of using through lines of railway communication for the new city had also to be taken into consideration.

The sites may now be discussed in detail by the Committee.

6. *The land on the eastern bank of the Jumna.*—The land on the east bank of the Jumna is hallowed by no historical associations except for the site of Lord Lake's battle of Delhi which is 6 or 7 miles away from the present city. To be recognised as an integral part of Delhi, a new capital, if located on this side of the river, would have to be placed on the bank immediately opposite the walls of the Fort. After examination of this ground the Committee came to the conclusion that it is altogether unsuitable for the location of the new capital. The banks of the Jumna are flat and liable to encroachment by the river. Large portions of this riverain are subject to flood and are unhealthy. The land behind the riverain is flat and uninteresting with a high subsoil water level. The whole site is cut up by the main line of the East Indian Railway which is in high embankment as it rises to pass over the Jumna bridge. Another bridge across the river would have to be built at great expense if any large settlement is made on this bank. The Committee are of opinion that nothing can be made of this area as a site for a new city.

7. *The sites to the north of Delhi on the west bank of the Jumna. The Durbar area.*—It was in this area that the stones commemorating the change of capital had been laid by Their Imperial Majesties. For every reason this tract deserved and received the most thorough consideration at the hands of the Committee. The Ridge and Civil Lines were identified with and consecrated to the British Raj. In the Barari plain the great Durbar commemorating the accession of King Edward the VIIth had taken place, to be followed in 1911 by the splendid pageant when for the first time in history a King-Emperor announced face to face to his Indian subjects his assumption of the Imperial Crown of India.

There were some general advantages in the site. For example this area is upwind and upstream from the present city of Delhi. The ruins and remains of the Delhis of the past do not cumber the ground. While the external communications might need improvement, the tract is fairly well served by existing railways. Roads and canals and the internal communication could be made convenient without excesive expenditure. A good deal of money has already been spent on the area; some of the objects on which this expenditure took place might conceivably have been worked into service when laying it out for a town. It was close to the main line to the summer Capital of the Government of India. At the northern end water effects could be obtained in the vicinity of the river. But when this site came to be considered in detail, the Committee found many disadvantages and difficulties. The area may be considered in detail.

The land between the Ridge and the Jumna on the side of Delhi city is perhaps a square mile and a quarter in extent. This comprises the Civil Station with some 120 bungalows, the Metcalfe Estate and a tongue of land running up the river bank by the Magazine to Wazirabad. This area in the past has developed in a haphazard fashion. In any town-planning scheme worthy of an Imperial City, it would probably be necessary to purchase all the interests and remodel it *in toto*. From estimates supplied by the Deputy Commissioner of Delhi, it appears that acquisition and treatment of this area would be very costly and would involve a dislocation of all the present European population, the majority of whom represent the business houses of Delhi.

The next area is the Ridge itself, approximately a square mile in extent. This is the only commanding position on the site; but the Committee understands that sentiment will not permit of new buildings beings erected on the better half of it. The portion from Flagstaff Tower to Hindu Rao's house and the Mutiny Memorial must remain sacrosanct; the Ridge can therefore never be more than

a rough park garnished with plain but hallowed buildings, while it runs across the best portion of the site and shuts out the view both of Old Delhi and the river Jumna.

The actual site of the Durbar camps is some three square miles in extent. Most of this land is flat and featureless, and any view which it has of Delhi is of its worst side. It has already been explained that much of the land here is liable to flooding and the subsoil water stands high. From the health point of view, the vital statistics of the villages in the area show an unhealthy past history, and recent examination of spleen index on the spot confirm the existence of bad malarial conditions. Much of the land is sour and retentive in character, resulting in an undesirable surface after rain and the ponding of water for considerable periods owing to the very finely divided nature of the surface soil. Little of this land is at present fit for permanent occupation. More areas could no doubt be added by a considerable expenditure on drainage and protection from floods; but in the end a considerable portion of the area would have to remain under a ban as far as building is concerned, and the only feature which could be obtained would be artificial water, while it would be costly and possibly dangerous to health to provide even this feature.

It should not be forgotten that if the Imperial Capital is to be favourably situated so as to present an effective appearance, it should, if possible, be approached along a line of rising ground. Here, unfortunately, the opposite is the case, and the approach from Delhi to the new centre of population would necessarily be along a falling line leading towards lowlying land flanked by flooded areas.

The suburb of Sabzi Mandi comes at one of the best points in the site, where the principle road for communication direct with Delhi would have to be through the break in the ridge. No fine scheme could be put forward for the site by the Committee, which would not entail the removal of this manufacturing suburb. The Deputy Commissioner of Delhi has not had time to work out an estimate of the exact cost of removal of the half square mile of buildings; but he estimates it to be very heavy, and there is the great disadvantage that such a removal would entail the disturbance of mills and the chief manufacturing settlement of Delhi.

The gardens north and west of Sabzi Mandi cover some four square miles. The value of these garden lands is estimated by the Deputy Commissioner at a large sum. The gardens are at present heavily water-logged, the environs of the gardens are unhealthy and the retentive soil does not allow water to drain away quickly. While their present condition could be remedied, the eventual gain, as far as a site for an Imperial City is concerned, would only be some flat country which would have been obtained at a considerable price and only made fit for building at a disproportionate expense. The open country in the direction of Pithampura offers no view of Delhi, and is generally a flat uninteresting country with a high subsoil water-level and mostly lying under the 700 foot contour line. The fall for drainage is very small. This plain would only be suitable for the expansion of the new city. This was not one of the areas which commended itself to the Military authorities for the new cantonments. In all probability, if any of this area was occupied by a large permanent settlement, there would have to be a somewhat expensive diversion of the Najafgarh drain. The whole site, while easy to supply with water is difficult and expensive to drain.

To sum up the points against the Durbar area the Committee consider that:—

(*a*) To put forward any scheme worthy of the Imperial Capital would involve the acquisition of the Civil Lines, Sabzi Mandi, and the Delhi gardens, entailing a large expenditure of money on land alone and disturbing important business and manufacturing interests.

(*b*) Though the cost of water-supply on this site would be cheap, sanitation and drainage would be expensive. Much of the area lies in the danger zone as regards health at present and the site instead of being naturally healthy or normally healthy would have to be made

healthy. Subsoil drainage, river embankment and sewage disposal would be troublesome and expensive items on the site. The natural outfall is near Wazirabad above both the intake of the water works and the present city of Delhi.

(*c*) The site is cut up by the Ridge, the Najafgarh drain, the Eastern Jumna Canal, the Grand Trunk Road, and the Delhi-Ambala-Kalka Railway. Difficult and expensive diversion and realignment would be entailed.

(*d*) There is a lack of sufficiently good building land near Delhi which could only be met by an extension into more distant and undesirable areas. The physical shortcomings of the riverain and Durbar area sight would push the Imperial City out towards the Pithampura plain into a country naturally flat and featureless and with no view or association with Delhi. The surface drainage of the Pithampura plain is extremely poor; the fall is almost negligible, and great difficulty would be experienced in providing satisfactory drainage here. The site is cramped owing to its peculiar physical condition, and even if, by including some doubtful building land, the city could be built at all in the tract, there would be no suitable area for future expansion and it would be impossible to imagine the growth of a great city at some future date in such a situation. The site is generally flat and uninteresting, and unless striking artificial water effects are permissible, which from the present point of view of health seems unlikely, it would lack all features of scenic beauty.

The indictment against this area is overwhelming, and the Committee feel that it is out of the question for them to advise the Government of India to select this area for the site of the Imperial Capital.

8. *The western slope of the hills to the south of Delhi.*—This area may be alluded to for the sake of convenience as the Naraiana plain. The plain has already been described in paragraph 4 of this report. Its characteristics are a good slope and a skirt of alluvial soil going high up into the hills. It is, in many ways, well suited for the location of a town, and the isolated rock on which Naraiana stand offers fine possibilities for striking building effects. This plain is open to the prevailing winds at Delhi and there is nothing in its past history to make the Committee consider it anything but naturally healthy. It has already gained the informal approbation of the Military authorities as an ideal site for a cantonment, combining a high and healthy location for the cantonment itself with magnificent expanses of grounds for manœuvres in close proximity. There is one reason however which, in the Committee's opinion, puts this tract out of court as a site for the new Imperial Capital. That is that this could not be considered to be Delhi. The plain is destitute of historial associations. The rocky flank of the ridge which runs out towards Rohilla Serai shuts out all view of Delhi, while it permits the smoky chimneys of the Delhi factories to be the sole evidence of where Shahjahan's Delhi lies. The main ridge obstructs all view of the older Delhis of the past. The rocky outcrop on the flank of the ridge at the northern end of the plain is inimical to free communication with Delhi, while the valley which lies between the ridge, its flanks and the city must, almost of necessity, be earmarked for the expansion of the present city. The natural tendency for extension is already in this direction and the presence of the railway enclosing one side of the valley offers a good line for the development of commercial and manufacturing settlements in the future.

This area also must, in the Committee's opinion, be left out of consideration as a site for the Imperial City.

9. *The eastern slopes of the hills to the south of Delhi.*—It is on the fringe of this tract that the Delhis of the past are situated. Standing a little to the Delhi side of the village of Malcha, just below the hills almost in the centre of the site, and looking towards the Jumna, Shahjahan's Delhi on the left fills the space between the ridge and the river. Following down from the present city on the foreshore of the riverain Firoz Shah's Delhi, the site of Indra Prastha, Humayun's fort, Humayun's tomb and Nizamuddin's tomb take the eye in a continuous progress to the rocky eminence on which Ghiyasuddin Tughlak erected

his fortress city. On the right the Lal Kot, the Kutb, the Kila Rai Prithora, Siri and Jahanpanah complete the circle of the monuments of ancient Delhis. The mid space in the foreground is filled by Safdar Jang's Mausoleum and the tombs of the Lodi dynasty, while to the left, towards Delhi, Jey Singh's gnomons and equatorial dials raise their fantastic shapes. With the exception of the settlement near the Kutb the ancient cities of Delhi were placed within easy reach of the river, and water-supply practically dictated the location of each successive city. It is for this reason probably that the land lying between the road to the Kutb and the Ridge was not used for any ancient metropolis.

The slopes are thus divided into two portions—the portion fringing the Muttra road together with the narrow riverain in which the ancient cities lay, and the portion adjoining the Kutb road and stretching up to the hills. In the direction of the Delhi Gate the former portion offers some building areas; but as the Muttra road advances to the south the land on the right adjoining the road becomes covered with tombs, and the triangle of country which has Nizamuddin's tomb as its apex and the Kutb and Tughlakabad as the points of its base, is thickly studded with ruins and remains. The difficulties of dealing with such an area are considerable and, incidentally, the drainage does not offer the same striking advantages as that of the area nearer the Ridge. The latter area, however, is completely free from these drawbacks.

It was therefore to the latter area that the attention of the Committee was particularly drawn. The land in between the neighbourhood of the Kutb road and the Ridge lies generally above the 700 foot contour and has excellent levels for drainage purposes; and indeed the fact that storm water and drainage of all kinds can have a rapid fall and be given an outfall above flood level makes the area stand alone in regard to one of the most important factors which influenced the Committee in the choice of a site. The investigations of the sanitary officers prove that the villages in this area have the healthiest past history of any of the areas under the consideration of the Committee. Lying 25 to 50 feet higher than most of the tracts observed, it is entirely removed from possibilities of flood. The good natural drainage and the low level of the subsoil water obviate the dangers of water-logging.

The site is not manworn. The monuments and remains of older Delhis, while they add to the attractions of the view from the site, lie in the lower land outside or to the east side of the site itself. Thus a free hand is gained in developing the site and the ground is not cumbered with monuments and tombs needing reverent treatment. Most of the soil is good and in continuous agricultural use. In the subsoil shallow beds of pea kankar occur; but they offer no obstacle to the treatment of the area. What appears to the Committee a point of extreme importance is that this site offers practically unlimited area for expansion over land suitable for building purposes. The site itself contains good points for the effective location of buildings of all characters and sizes, and offers opportunities of securing good views of the historical and archæological remains of the ancient cities.

The site is near the present centre of the town of Delhi and there will be no difficulty in making a fine approach from good points in the old city, as well as other notable avenues. A new city located on the site would be served with direct communication, to the centre of the present city and its ends abutting on the Civil Station at one extremity and the Delhi Gate at the other.

It has already been stated that the Military authorities have informally approved of the Naraiana plan on the other side of the Ridge with its wide expanses stretching towards Palam as a good site for a cantonment. The relation of this site to such a cantonment is almost ideal. The access to the Naraiana plain at points near the centre of the site is easy to secure. The cantonment would be near but not too near the Imperial City. Amenities such as clubs, race courses, golf courses, polo, tennis, cricket, football and hockey grounds could be arranged for at a place where they could be made use of jointly by soldiers and civilians throughout the year. Railway communications can, it is understood, be easily afforded, and there would be little difficulty in combining a single line of communications to meet the needs of the settlements on each side of the ridge.

The site contains nothing useful or valuable which would have to disappear. While new communications by road both internal and external offer no obstacles, no existing road of importance would need to be interfered with seriously. The important communications in this direction are the Muttra road, which would remain unaltered, and the Gurgaon road. The diversion of the latter will form an indispensable service road for the new Capital with no serious inconvenience to through traffic. Connections with the Kutb and the village in its vicinity will be provided for by a road along the eastern boundary of the site connecting directly with the Delhi Gate.

Acquisition of land for this site will displace no business centre or manufacturing interests, nor interfere with the legitimate expansion of the present city into areas in which its natural extension is to be anticipated. Incidentally the land which will be acquired for this site is extremely cheap, and while no consideration of expense should, in the Committee's opinion, limit the acquisition of land both for the new city, its parks, gardens, future expansion and for the isolation zones around it, it is a fortunate circumstance that the moderate price of land in this part of the Delhi district will render it impossible to entertain even a thought of such limitation.

The supply of water to this site for irrigation can be arranged, but will be more expensive than a gravitation supply. This is counterbalanced by the fact that if any other site in the vicinity of Delhi had been chosen, drainage, sanitation and protective works against floods would also have involved great expense.

Among the limited sites available the Committee have no hesitation in advising the Government of India to select this site and consider the physical, sanitary, æsthetic and general consideration in its favour overwhelming.

10. *Land acquisition.*—With regard to the area of land which should be acquired, the Committee recommend that all the land shown on the map, accompanying this report, in red, should be purchased. This area includes the land required for the site of the Imperial City and cantonments as well as a margin for expansion and isolation zones.

The Committee further recommend that the area coloured green on the map should be acquired for the extension of the present city of Delhi and the Civil Station and for the purpose of sanitary measures in the interest of the health of Delhi and indirectly of the new Capital. In developing schemes for communication or for the improvemnt of the old city, much of this area will probably have to be acquired in any case. The land will increase in value and, as it is certain to be needed in the future, it would be a short-sighted policy not to acquire it now.

The area coloured blue on the map will form the environs of the new Capital. From the point of view of sanitation and general administration it would be necessary to have a firm control over this area. The Committee are of opinion that such a control should be secured by legislation, or, failing legislation, that this area should also be purchased.

The area coloured brown represents the portion of Delhi and its suburbs which have already been developed. The acquisition of this area is not advocated. The only suburb of Delhi, where acquisitions will, under this scheme, take place, is Paharganj.

11. *Future programme.*—Having now completed the first section of their work and recommended a site for the new Capital, and having proposed a number of preliminary schemes in outline for the laying out of this selected area, the question of further procedure arises.

It is understood that the Government of India will reside in Delhi from October to April, during the cold weather months; but this Committee have not seen the site at that time of year, as they did not reach Delhi until the middle of April when the hot weather had set in.

They feel that before submitting their final plan and recommendations it is of great importance that they should have an opportunity of examining the site and surroundings under the conditions which prevail when the Government of India will occupy their winter capital.

On the other hand the selection by the Committee of the southern site with its higher land, superior surface fall and favourable conditions for drainage, and the rejection of the northern site with its liability to flood and water-logging, makes it unnecessary for them to carry out their original intention and observe this ground during the rainy season.

They, therefore, propose to return to England at this stage and to come out again to Delhi in the cold weather months in order to complete their plan and to submit their final recommendations.

Such a course has considerable advantages. It will give time to the Government of India to acquire the land needed for the site of the new city and cantonments and to complete the collection of the more fully detailed information required with regard to the southern site which could only be put in hand after it was chosen.

It will also enable the Committee during their absence, to consider more fully and mature the details of their proposals for the creation of a worthy city.

G. S. C. SWINTON, *Chairman.*

JOHN A. BRODIE, } *Members.*
EDWIN L. LUTYENS, }

HOLCOMBE, SIMLA ; }
13th June 1912. }

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DELHI

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VICINITY.

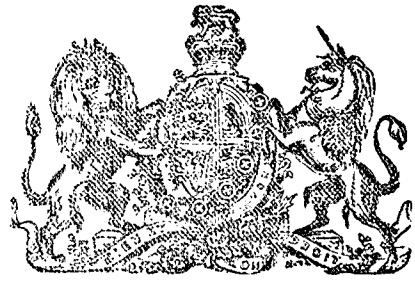
I.—(PHYSICAL FEATURES.)

Scale 1" = 1 Mile.

DELHI, GURGAON, MEERUT
& BULANDSHAHR DISTRICTS

DELHI & VICINITY

PHYSICAL FEATURES



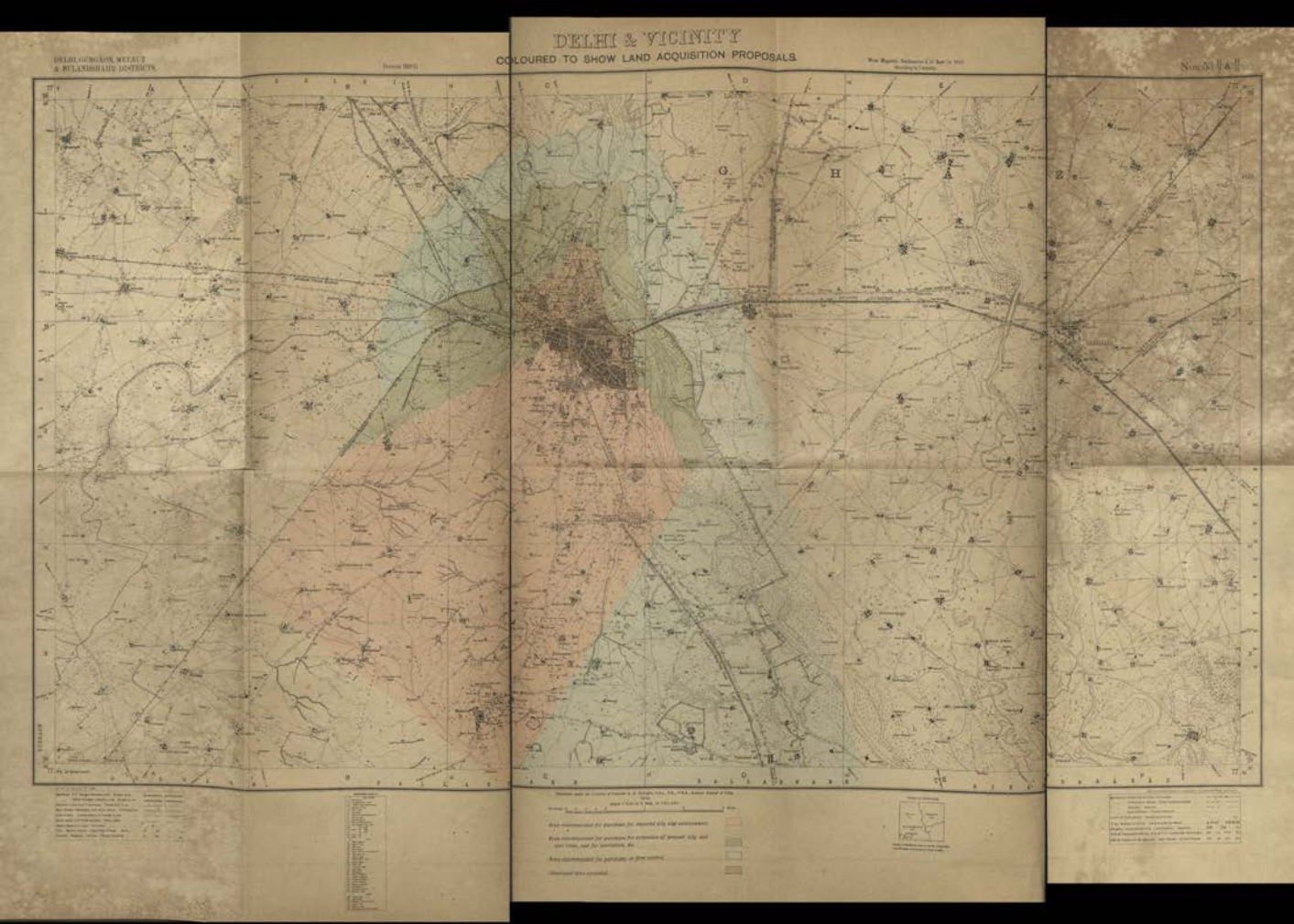
DELHI

AND

VICINITY.

II.—COLOURED TO SHOW LAND ACQUISITION PROPOSALS.

Scale 1″ = 1 Mile.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EAST INDIA (DELHI).

SECOND REPORT

OF THE

DELHI TOWN PLANNING COMMITTEE

REGARDING THE NORTH SITE.

WITH MEDICAL REPORT AND TWO MAPS.

Presented to both Houses of Parliament by Command of His Majesty.

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To

HIS EXCELLENCY THE VICEROY
AND GOVERNOR-GENERAL OF INDIA.

11th March 1913.

YOUR EXCELLENCY,

In accordance with instructions received from Your Excellency I have the honour to present a special report of the Delhi Town Planning Committee on the possibility of building the Imperial Capital on the North Site.

I have the honour to be,

Your Excellency's obedient servant,

GEORGE S. C. SWINTON, *Captain,*
Chairman, Delhi Town Planning Committee.

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APPENDIX.

Detailed discussion of Sir Bradford Leslie's scheme.

MAP.

Map showing the levels of low-lying area and tract suitable for building upon. Scale 2″=1 mile.

REPORT ON THE NORTH SITE BY THE DELHI TOWN PLANNING COMMITTEE.

The previous consideration of the north site by the Committee.

1. The chief considerations which the Committee had in view in choosing a site for the new capital, are set forth in paragraph 2 of their report of the 13th of June 1912 on the choice of a site for the New Imperial Capital at Delhi. The new city was to be located in an area in close physical and general association with the present city of Delhi and the Delhis of the past. The Committee understood that it was to be a capital in the true sense of the word, and that its development was to be a fulfilment of the Royal decision regarding the transfer of the seat of the Government of India from Calcutta to the ancient Capital of India. The Committee was informed that it was possible that the residence of the Government of India in the future at Delhi might extend to seven months of the year. The Government of India had placed their requirements, after due enquiry, at 10 square miles for the new city and 15 square miles for the cantonment. It was therefore essential to choose a large site near Delhi with ample room for expansion. It was above all necessary to choose a healthy site on which sanitary needs could be safeguarded at a moderate cost. In a seven months' residence at Delhi the fact that one month of the autumn in certain localities is malarious and one month of the spring is hot have to be faced and met. The north site, often called the Durbar area, was carefully weighed in the balance by the test of these governing conditions by the Committee last summer and found wanting. The conclusions of the Committee in regard to it, which are summed up in paragraph 7 of their report, were to the effect that a healthy capital city to be laid out on a large scale in this area and to be occupied for seven months of the year was impossible save at vast expense.

Revival of interest in the north site: its advantages.

2. Shortly after the return of the Committee to India at the close of 1912, public attention was directed to the north site. On the 12th of December 1912, Sir Bradford Leslie, an engineer with a distinguished Indian career, read a paper before the Indian section of the Royal Society of Arts in London, in which he set forth plans for building the new capital on the northern site and producing a fine water effect by a treatment of the river Jumna. This paper aroused considerable attention in England : and its publication synchronised with a number of letters and articles in the press in this country expressing a preference for the northern site. The latter voiced a natural attraction to the north site which the Committee themselves experienced on their first visit to Delhi, and enunciated some predelictions which the Committee had at one time felt and later abandoned. These sentiments championed the northern site from the point of view of its more obvious advantages. It has its memorable association with heroic deeds and great names. It is the scene of the Durbars. It is the place where Their Imperial Majesties laid the Commemorative Stones. It is the place where such English population as Delhi has at present, now reside. It has some bungalows, gardens and trees. It is near some temporary amenities such as the polo grounds, the shops at the Kashmere Gate, and the Chandni Chowk, which the residents are in the habit of using. It shelters in reasonable comfort the existing population augmented by additions for the camp offices of the Government of India. Why should it not contain all the population which was to move here ? These views were expressed with abundant force, honesty and enthusiasm, and undoubtedly have their roots in fact. Few of the writers however moved beyond the more obvious limits of the associations of sentiment and custom into the real problems of the situation. No thought was taken of the area which had to be provided, or of the total number of the population which must eventually reside on the site if this was to be the permanent capital and the seat of Government for seven months in the year. Full weight was not given to the undoubted ideal that the new capital was to carry on in British hands the tradition of Imperial Delhi and set a standard of beauty, comfort and health for India. The sanitary and engineering difficulties of the site and the question of cost found no place in

these schemes. Above all to many this was the only site with which they had personal acquaintance, and the south site was dismissed from their horizon without a consideration of its merits as an unknown land.

Reason for reconsideration of the north site.

3. The public pronouncement of a distinguished engineer and the expression of a considerable volume of public feeling in favour of the north site demanded an enquiry as to whether any modifications of the original conditions would render it possible to use the north site. At the desire of His Excellency the Viceroy the Committee set themselves to consider whether any possible alteration of the data would make it feasible to place the New Capital on the north site.

The possibility of reducing the area required for the New City.

4. The original estimate of an area of 10 square miles was arrived at in the following manner. Lists were supplied by the Government of India of the number of officers, clerks and menials who would be located in the New Capital. Units of area were approved by the same body for the space for compounds. The decision of the Government was communicated as to the allowance to be made for Government House, the secretariats, residences for Ruling Chiefs, Indian nobility, gentry and plutocracy, commercial and educational requirements, administrative and municipal buildings. The total of these areas after allowance had been made for parks, expansion and roads came to 10 square miles. The problem now before the Committee was the reduction of the land required for the New City from 10 square miles to a figure which should not exceed the total area of good land which can be made available for building purposes on the northern site.

It was not of course possible for the Committee, in the short space of time available for the reconsideration of the question, to make a reference to the Government of India in regard to possible reduction of areas. All the departments were involved, and the previous figure had only been arrived at by the Government of India after lengthy consideration and discussion. It was not possible for the Committee to alter in any way the number of officers, registrars, clerks and peons, in regard to whom the Government of India had come to a definite decision that they would be posted at Delhi. It was considered unlikely by the Committee, that if Delhi was indeed to be the capital and seat of Government, any reductions, which might be made, would take the form of cutting down the number of officials and officers who would have their headquarters at Delhi. It was accordingly to the question of areas that the Committee turned their attention. The areas fixed by the Orders in Council, dated 21st June 1912, which were communicated to the Committee, were compounds varying in size from six acres for a Member of Council to 3 acres for an Under Secretary or junior officer. After consultation with various officers the Committee tentatively cut down the size of these compounds to a standard varying from 3 acres for the former to $2\frac{1}{2}$ acres for the latter. Another important change was made in the method of computation. Orginally it was assumed that an official residence would be provided for every official. In working out a reduced scale of area however the Committee assumed that $\frac{1}{3}$ of the officials of the secretary class would live in hotels or flats and that $\frac{1}{2}$ of the deputy secretary and under secretary class would be similarly accommodated and would not require residences. Other reductions in other areas were also effected. Detailed lists were drawn out and compared by the Committee.

As a result of this comparison, while the total of the area of the original list after allowing 25 per cent. addition for roads came to 6,677 acres or rather more than 10 square miles, the total of the new list after allowing the necessary addition for roads came to 3,152 acres or almost 5 square miles. The former lay-out has an inherent provision for expansion as a large park space of 500 acres is provided and the large number of compounds admits of addition of other buildings as the town develops. The latter lay-out however has only 175 acres of park space and with the reduced number of compounds provides no inherent space for expansion. It was also necessary to assume in the latter case that certain items of the former list such as the residences of Indian nobility and gentry, the university, colleges, museum, oriental research institute, places of recreation such as theatres and concert rooms would have to be provided for in old Delhi outside the lay-out itself. The efforts of the Committee to secure a minimum lay-out point to the conclusion that an area of about 5 square miles is required and that this will provide no area for extension.

An attempt was made to exercise a countercheck over this figure by computing population in detail. The method pursued was to take each item in the former list and assume that a certain proportion of these units would be married and a certain proportion would have children, the number of servants to each officer or clerk, and the population of the native bazar, etc., was computed. The maximum figure reached was 57,000 and the minimum about 30,000. In the opinion of the Committee, though a maximum population must be assumed in this way for working out estimates of water-supply etc., owing to the speculative factor of the number to be added on for the families of officers, clerks, peons and servants, a population basis is an insecure one on which to calculate areas. There is a presumption that as far as Indians are concerned, as Simla offers little attraction to them to keep their families with them during their hill sojourn owing to lack of accommodation and uncongenial climate, the number of Indian families at Delhi will be considerable. In the opinion of the Committee if the speculative maximum of 57,000 souls were ever attained, a minimum area of 6 square miles would, in the interests of sanitation, be required for their accommodation.

For working purposes however, the Committee have decided to adhere to 5 square miles as the figure for a restricted lay-out.

The area available for the new city on the north site.

5. Turning to the area available it is found that the total area of land lying to the east of the Grand Trunk Road, not at present developed, excluding the southern portion of the ridge, the parks, cemeteries, civil lines and open land outside the city walls amounts to four square miles: and that, if the area of the Civil Lines together with the *Bela* north of the railway bridge be added, a total area of five and a quarter square miles can be obtained for the site of the new city. A map of the district is attached to the report.

(a) Area subject to flood.

The area subject to flood is shown on this plan; it lies to the west and north-west of the ridge. The low-lying land between the flooded level at 680′ and the contour line of 685′ is shown in yellow; the land actually flooded between 680′ and 675′ is shown in light blue, while the land which is flooded to a greater depth than 5 feet lying below 675′ is shown by a darker shade of blue.

(b) Area irrigated by the Western Jumna Canal.

Adjoining the lands liable to flood and extending to their west lies the tract irrigated by the Western Jumna Canal. Much of this is heavily water-logged on account of the present unsatisfactory methods of irrigation by means of open earth channels and the existing lavish supply furnished by the canal. It will be noticed that even on the *bangar* or high land, many feet above the level of flood water, there is a permanent pond surrounded by marshes near the village of Wazirpur. Much of the soil is stiff clay and even if the water-logging was cured, it is not the sort of land, if other was available, on which it is advisable to build.

(c) The Civil Lines.

The area in between the Ridge and the river known as Civil Lines is intersected by 8 main ravines or *nullahs* which run in an irregular course from the foot of the Ridge in the direction of the river. The northern end of the Ridge itself is scarred with quarries from which metal for the construction of the Civil Lines roads Durbar and Temporary Delhi works have from time to time been taken. The soil at the base of the Ridge is poor and rock is near the surface. Considerable treatment would be required to render this strip of subcolline land suitable for trees and gardens. Therefore the undeveloped land lying between the Ridge and the river as well as the northern end of the Ridge itself could only be utilized for detached buildings unless a considerable expenditure is incurred in the filling up and levelling of the *nullahs* and other rough portions of the site.

(d) The *Bela*.

The *Bela* lies on the foreshore of the river in between Metcalfe House and the railway bridge. If a city is to be established on the north side at all, it is necessary, for purposes of sanitation and prevention of malaria, and in order to secure building land and aesthetic effect, to treat this area and adopt some form of river training. It is therefore intended to utilize it to the fullest advantage. In order to do this heavy expenditure must be incurred in raising it and in the formation of a river training wall and embankment along the whole frontage of the river from Wazirabad to the Railway Bridge, a distance

of about 4 miles. The *Bela* must be raised to at least five feet above high flood level if it is to be fit for building purposes. It is to be remembered that the process of raising will take a number of years and therefore this area will not be available for building on till long after the rest of the city is complete.

Special points in connection with the north site. (*a*) Cost and result of the purchase of Civil Lines.

6. The purchase of the Civil Lines, comprising an area of about 500 acres, has now been estimated to cost not less than £383,000; and, as its rearrangement to suit the new conditions would involve the destruction of a large number of buildings, which are at the present time in occupation, great inconvenience would necessarily be caused to the permanent residents in this portion of Delhi as well as to the members of the Government of India and their staffs. In fact it is probable that during a portion of the time while the new city was building, the present cold weather settlement of the Government of India known as temporary Delhi would have to be deserted, while the commercial community and the local administration would have to prosecute their vocations in the midst of intolerable noise and dust and a large accumulation of labour and materials. During this period communications would be most difficult, for although several miles of roads have in the past been constructed in the Civil Lines and large amounts of money expended, there has been no preconceived scheme of lay-out, and in any reconstruction of this area these roads could only be utilized to a limited extent as in many cases the gradients are steep and the directions irregular. Almost everywhere widths are insufficient and allow no provision for pavements of adequate size or efficient arrangements for drainage. It is to be feared that many of the trees and temporary amenities, which are the present attraction of the northern site, would have to disappear in the process of reconstruction. Those who wish to build on the north side should realize that they would be actually destroying many of the picturesque beauties which they most wish to preserve.

(*b*) Difficulties about the treatment of areas west of the Ridge: (*i*) Diversion of the Najafgarh drain.

If the area west of the Ridge is to be occupied by houses built closely together, as would be required in the case of a restricted lay-out, it would be found necessary to remove the Najafgarh drain entirely to a point south of the present city of Delhi, or to reconstruct it by a diversion of outfall to a point near the Kudsia garden creek. These are the only two courses which would work in advantageously with any lay-out on this site, and in the interests of health and appearance, and on account of the inconvenience of the numerous culverts requisite and the serious variations in its water level, it is quite impossible for the Committee to advise the retention of this drain in its present condition. The cost of the former scheme of diversion would be about £110,000 while the cost of the latter is estimated at £50,000.

(*ii*) Low-lying land.

This area is subject to flood from three different sources—the river, the Najafgarh drain and local rain. No treatment other than that of raising the area can, in the position prevailing, change it into satisfactory building land. The estimated cost at Rs. 12 per 1,000 c. ft. of raising these areas is as follows:—

Yellow, say 3 feet, £75,000 per square mile.
Light blue, 8 feet, £225,000 per square mile.
Dark blue, 11 feet, £300,000 per square mile.

It would also be necessary to treat the low-lying and flooded areas near the site so that they might be put into as good a position as possible from the malarial point of view; and it is felt that considerable expenditure would be incurred in meeting the reasonable requirements of the sanitary officers in this direction. The malarial history of the north site is bad while the record of the southern site is good. The Committee are of opinion that even after proper attention to sanitary matters the south site is likely to be generally better from the point of view of health than the north site. The great difficulty about the northern site is that not only is expensive treatment needed to enable the land to be used for building purposes, but the surroundings are also unhealthy, and considerable work entailing large expenditure would have to be undertaken on the environs of any new capital located in this area.

(*iii*) Sewage disposal.

The arrangements for the disposal of sewage would be difficult on this site, and a permanent sewage pumping station would be required in the neighbour-

hood of Wazirabad from which the sewage would be delivered to a sewage farm on land lying across the river, at a distance sufficiently great to prevent the possibility of justifiable complaint or contamination of the drinking water supply.

General points in connection with the new city : (a) The question of room for expansion more vital than ephemeral amenities.

7. The want of room for expansion is a point which should receive very careful consideration especially as affecting a capital city intended to have a long life. Local social or economic conditions, many of which are of a purely temporary character, should not be allowed to have undue weight attached to them in competition with the needs of the future. Foresight is the essence of successful town planning. The Committee feel that in coming to a conclusion as to the suitability of any of the proposed sites they should pay more attention to the requirements of the future than to the views of those who are interested for special reasons in a particular locality. There is often a tendency to give undue weight to troubles which are only likely to be of short duration; for example, it is quite true that for a time at least some inconvenience may be caused owing to the change in position of the present shops and shopping quarters, when the Government of India move to the south site; but too much importance should not be attached to this point, as in the event of any well-considered scheme of lay-out being adopted, the shops and hotels, as experience has shown elsewhere, will follow the traffic and develop in the neighbourhood of the new main railway station.

(b) The initial cost of the ground.

The cost of the north site and its preparation, if charged to the tenants or occupiers on the whole area in the form of rent, would be a serious handicap. The effect of choosing it might well be that the expansion, which may naturally be expected in a capital city, would not take place, or at any rate be diverted in other directions.

(c) The provision for cantonments.

The Committee were informed that it was the intention of Government to locate a new cantonment in the vicinity of the new capital. In such cases a healthy and sanitary situation is vital, because it must be remembered that the cantonment has to be lived in all the year round. The area to be provided is large. Where a large expanse of land with a good fall and healthy condition of subsoil water does not exist, the cost of raising levels of land or alternatively the cost of providing artificial drainage and possibly pumping plant to remove water after heavy rain is a serious matter. The fact, therefore, that no large tracts with favourable natural conditions of surface drainage can be provided in the vicinity of the north site is a feature of much importance. The Military Authorities have twice failed to find any suitable site in the neighbourhood, and the most that could be done under the circumstances was to reserve a square half mile where a detachment from the cantonment on the south could be located. This area is marked " Military " on the Map.

(d) The provision of land for recreation.

No site in India can be considered suitable unless it provides room for outdoor sports and recreations under healthy surroundings; and the general character of the land lying outside the proposed building area will not be satisfactory, even after it has been dealt with by drainage and treatment. It will not be possible to make such spaces available for use throughout a considerable portion of the year as the land is a stiff retentive cold clay and the situation such that it cannot be guaranteed against malaria in bad seasons.

(e) The narrowing of ideals.

It is felt that it would be a grave mistake if a point of view was adopted that the Civil Lines with some additional buildings could be the capital of India and the seat of Government. It would appear to be a complete desertion of the ideal of the conception and a drifting away from all breadth of treatment and largeness of view. It is considered that the main features and buildings of the new city should at any rate be as interesting, after centuries have passed, as the older buildings in the neighbourhood are at the present day.

Planning on the north site.

8. The plans, which have been prepared, show that the area of good ground available is, however, sufficient to meet the immediate present requirements as reduced, and that a city, most of which will be closely built, can be laid out on the northern site. There are drawbacks, however, to a lay-out even of this size. Calcutta conditions in the climate of Delhi for a seven months' residence are an impossibility.

Scenic aspect from north Ridge.

It is quite true that the views from the historic portion of the Ridge are very extensive and beautiful especially in the evening with the foliage in its present condition; but it should be borne in mind that when the surrounding area is closely built upon, the conditions will be different; many of the trees, which at present exist in the large compounds in the Civil Lines, will necessarily have disappeared, and most of the fine views will be spoilt by the roofs of houses and buildings, which in some cases will be level with the eye when driving or walking along the Ridge. The view to the west from that portion of the Ridge, where the Mutiny Memorial stands, is much spoilt by the manufacturing suburb of Sabzi Mandi with its tall smoky chimneys. This suburb is an unpleasant neighbour for the north site, severely handicapping any successful plan. The cost of its acquisition or radical modification however is so great that the Committee unfortunately cannot see their way to make a recommendation in regard to its removal. As one of the chief commercial assets of Delhi it would be out of the question to limit its expansion in the future.

The Committee were at first very favourably impressed with the purely architectural possibilities of portions of the northern site and deserted its power for scenic and architectural beauty with regret. If the city to be designed were to occupy only 3 square miles, and lavish expenditure could be faced, it would be possible from an architectural point of view to obtain fine results.

Comparison of cost of a city on the North with a city on South site.

9. In making calculation for comparison it has been necessary to assume that a lay-out on the south site will also only occupy 5 square miles. The actual charges falling on land will be as follows on the two sites :—

	North.	South.
Cost of land	£420,000	£100,000
Special treatment of north site—		
(*a*) Bela and promenade	450,000	
(*b*) Levelling	95,000	
(*c*) Raising lowland	55,000	
Special treatment of south site		53,000
Total	£1,020,000	£153,000

The extra cost falling on land is £867,000 on the north site.

The excess cost of other operations on the two sites is as follows :—

North.		*South.*
Equal	Sewage and storm water, Water supply, Irrigation, Roads	Equal.
£50,000	Najafgarh Jhil Drain	
£50,000	Canal (Western Jumna)	
	River training	£50,000
Equal	Railways	Equal.
	Afforestation	£45,000
Total £100,000		£95,000

The total extra cost of the adoption of the north site would thus be £872,000.

A brief discussion of Sir Bradford Leslie's scheme.

10. Sir Bradford Leslie's object in preparing his scheme appears to have been to provide the province of Delhi with improved public health, electric power, additional land for building and an improved river frontage; he proposed to accomplish this as follows :—

(*i*) a large lake to be constructed by building an over fall weir at Feroz Shah Kotla, the surface to be four feet above flood mark, *i.e.*, at R. L. 676.

(*ii*) the large volume of water thus stored to be used for electric power and to replace the losses by evaporation and absorption from the lake itself.

(*iii*) the electric power to be used for pumping drainage from the Durbar area, also for dredging to raise land for building along the river front.

From the plan that accompanies his paper it is evident that the author had very little accurate information in regard to the site or in regard to the conditions of flow in the Jumna. The conditions of the site are such that large areas must be submerged or elaborate embankments and drainage works constructed as a remedy. The variations of the latter preclude the possibility of extracting useful power, as the fall in the monsoon months and the flow in the remaining part of the year is small and uncertain. Furthermore the capacity of the lake would soon be reduced by silting to the size needed to discharge the normal monsoon volume. In any case the stored water must replace evaporation losses as well as supplement the supply required by irrigation and power, two functions that are not likely to help each other out when the weather varies from the normal. The power would be costly to instal, uncertain in quantity and could be of no commercial value, being subordinated to the duties of pumping and dredging necessitated by the design of the lake.

The proposal in the form advanced is not practical; but with levels suited to the locality and without the adjuncts of hydro-electric power, a river training scheme can be devised that would improve the health of the city, add to its appearance and incidentally help to redeem land that would eventually be valuable.

A longer discussion of the more technical points in the scheme is printed as an appendix to this report.

Conclusions in regard to the north site.

11. The advantages and disadvantages of the north and south sites may now be finally considered. On the north site there are the associations of 1857, of the Durbars and of the Commemorative Stones laid by Their Imperial Majesties. Proximity to the river and the Ridge give certain scenic advantages. In the winter months the site is generally upwind of the present city. It is also up stream. There are the temporary amenities of proximity to a shopping area, a railway station and existing recreation grounds. It is apparently nearer to the present city of Delhi. It is at present used as a residence by an existing permanent population and by the camp offices of the Government of India in the cold weather; its adaptation to be the permanent seat of the Government of India is therefore not beyond the limits of possibility. There are some roads, bungalows and trees on the area already. The Committee freely admit the great architectural possibilities in the site provided the area required can be restricted to three square miles and there is no lack of money to be spent.

The disadvantages of the site appear to the Committee to be as follows:—

In the first place, in order to fit the city on to this area at all, the areas allotted by the Government of India for each item in the city have to be cut down, and certain items have to be excluded entirely. This is beginning town planning at the wrong end, when equally suitable sites are available elsewhere. The site should be chosen to fit the requirements, and not the requirements modified to suit the site. While the Committee do not deny that some cutting down of the areas originally provided is possible and probably desirable, the question of reduction of areas for residence to a minimum is one in which there is room for considerable difference of opinion. Even if it is assumed that those at present interested in the site are desirous of living in small compounds, it is equally conceivable that those who follow them may not be of the same opinion, particularly as it may well happen that at some future time a greater proportion of the year will be spent at Delhi by the Government of India than is at present contemplated. The idea of limiting the provision to be made in the new city and of providing no room for expansion augurs a lack of faith in the fortunes of the new capital as the permanent seat of the Government of India. It would be building on an insufficient framework based on small ideas rather than large views. Such a policy could hardly produce a city which would give a capital, evolved under the guidance of British rule, as a pattern and inspiration to the East. Yet apart from the ideals conceived for her, everything promises well for new Delhi. To deal with the question of associations. By adopting the south site, the heritages of the memories of 1857 and the Durbars are not lost to us. The new city on that site however goes back further and gathers the strands of many centuries and empires into the new Imperial whole. The scenic effects

of the Ridge and River can be secured on the south side also. The Ridge can be afforested there and a wild park made where the view will not be spoilt by the smoky vistas of Sabzi Mandi. A water effect can be afforded there at less cost and without sanitary drawbacks. It is to be remembered that all the fine monuments of the Delhis of the past are to the south. During the period of the residence of the Government of India the site to the south is sheltered from the cold weather winds and far enough from the Ridge in the warmer months to escape the radiation of heat. On the north, half the site is exposed to the north and north-west winds of the winter and the rest is too near the Ridge for comfort in the heats of the autumn and spring. The remarks about sewage disposal on the north site show that the upstream position of the city is a positive disadvantage. The temporary amenities of the northern site would mostly disappear in the process of reconstruction. During this period the permanent residents would be subjected to great discomfort and inconvenience while the Government of India would probably have to stay away altogether. Better trees and better gardens can be made on the southern site. The work of construction on the southern site can proceed without disturbance to the present population of Civil Lines or the temporary residents from the Government of India. That the present residents of the northern area would with few additions be the eventual population of the new capital is a fallacy. Only about $\frac{1}{4}$th of the officials and about $\frac{1}{10}$th of the clerks and peons of the Government of India are in Delhi at present, and these have only the reduced establishments rendered necessary by the exigencies of insufficient accommodation and camp life. It is hard to visualise a new city on the southern site and compare it with existing conditions on the north; but a study of the various lay-outs which the Committee have attempted, show that Government House on the southern site may actually be nearer the Juma Masjid, which may be taken as the centre of Delhi, than when located on the north site. The distance of the nearest edge of new Delhi to old Delhi on either site will be the same. Hotels, shops, and recreation grounds and other amenities and conveniences will spring up where the people go and where fashion or necessity dictate on either site. The soil is poor on the northern site as compared with the southern. The southern site is already healthy and has healthy surroundings. The northern site even after expenditure on sanitary requirements will never be satisfactory. If the northern site is to be made healthy, this involves going outside the site itself and making the neighbourhood healthy also. The building land to the south is generally good. On the north to be used at all it has in places to be raised at considerable cost. There is no really suitable healthy site for a cantonment in proximity to a city on the northern site. The exigencies of fitting in the requirements to the limited area of the northern site endanger the success of a lay-out as a whole and tend to make for cramping and bad arrangement. The result of placing a city on the northern site appears to the Committee to be the creation of a bad example in place of a good one.

It is unfair to tie the hands of the future and reject the dictates of foresight. The governing principle of the town-planning movement is foresight. Though the desire to improve and beautify has been grafted on to it, much to its advantage, the movement originated not in aesthetics but in necessities, borne in on town dwellers of all countries by hard experience of difficulty of communications, dear land and out of date sanitary conditions, involving inconvenience, congestion, bad health and vast expenditure. Above all they had learned the need for space, space at the centre to allow of the creation of fine buildings and improved amenities, space on the outskirts to accommodate an increasing population. For, in the twentieth century few cities are decaying or standing still. The majority are expanding by leaps and bounds.

It is inconceivable that Delhi will not grow. She is the most central spot in the Railway system of India; she possesses historic and artistic interest, and she is once more India's governmental Capital. Necessity, convenience, and fashion will all bring people to her.

And, if she must expand, let this be remembered. It is a question of comparison.

If the city is placed on the south side expansion will take place over land which is cheaper, better, and more healthy the further she grows.

On the north, once she overlaps a limited area, the land becomes more costly to buy or to treat, worse in soil and less healthy.

The Committee were brought to India to advise on town planning. They would be false to their trust if they gave any other advice than this.

Even now, with the requirements of the city cut down to the lowest point, they must re-affirm the views which they expressed last June. They believe that the northern site is too small and too cramped, and that a worthy city cannot be safely fitted upon it at all, far less provided with ground over which to expand, without including some land which will be very costly to buy and much land which will be very costly to make healthy, even if so sour and poor a soil can ever be made really healthy.

They hold that when there is a better, cheaper and healthier site conveniently at hand it is out of the question for them to advise the Government of India to select this northern area for the site of the Imperial Capital.

GEORGE S. C. SWINTON,
Chairman.

JOHN A. BRODIE,
EDWIN L. LUTYENS,
} *Members.*

EXPERTS' CAMP, DELHI,
Dated 11th March 1913.

APPENDIX.

Note on Sir Bradford Leslie's scheme as propounded in his paper entitled "Delhi the Metropolis of India" read before the Royal Society of Arts.

Objects and general arrangements of the scheme.—Sir Bradford Leslie's object in proposing his scheme is to provide Delhi with improved public health, with electric power, additional land for building and an improved river frontage, and he proposes to accomplish the object by the construction of an overfall weir across the Jumna with roller shutters designed to hold up surplus flood water to a maximum height of 4 feet above the high flood mark opposite Firozshah Kotla. This level would be R. L. 676, and water at this height would submerge the whole of the Bela in front of Delhi to a depth of 6 to 10 feet and also a large portion of the Barari plain to a depth up to 4 feet. Sir Bradford Leslie in his paper does not explicitly mention the necessity for any arrangement to exclude water from the Barari plain but perhaps this was because he had no knowledge of the land levels at hand, and he clearly recognises the desirability on the grounds of health of keeping the Barari plain dry, as he formulates a scheme for draining the Durbar area by pumps, actuated by water-driven electrical machinery, during periods of large flow in the river. Unless confined within restricted limits the lake would flood a very large area on the left or east bank of the river both above and below the bridge, and this undesirable result Sir Bradford proposed to obviate by the creation of a reclamation embankment six or more miles in length and of sufficient width to allow of roads and building sites; such reclamation to be carried out by dredging from the river bed.

Included in his scheme is a proposal to reclaim about half a square mile of land on the right bank of the river from Chandrawal to Selimgarh Fort, also by dredging from the river-bed. By these means the object of the scheme is to be attained, in so far as it causes the submersion of the low-lying Khadir lands, which form, in his opinion, at present a malaria nidus; with questions of health this note has nothing to do, confining itself merely to the engineering problems connected with the scheme.

2. *The advantages to be got by storage.*—Sir Bradford claims that, by the storage of large quantities of water by means of a weir, the following advantages will ensue:—

(*a*) The possibility of generating electrical energy by means of water-driven electrical machines.

(*b*) Compensation for loss by evaporation and percolation.

(*c*) A valuable storage for supplementing the supply of the Agra Canal off-taking from the river at Okhla in times of need.

3. *Hydro-electrical energy.*—First, as to the generation of electrical energy, it is evident from the plan submitted with his paper, that Sir Bradford Leslie had very little accurate information with regard to the site at the time of writing, and this no doubt led him into error with regard to the possibility of obtaining electric power from water storage. The conditions of flow in the river Jumna, however, precludes the possibility of extracting useful power continuously throughout the year, as during the rainy season, there is a large flow of water without the possibility of any appreciable fall, whilst in the dry season, as most of the water (in fact, for some months the whole of the water) is diverted into the canals at Tajawala, the flow in the river at Delhi falls very low, and indeed it would not be possible to count on a greater flow than 100 cusecs, and even this figure is a risky one to take as a certainty. The lake proposed by Sir Bradford Leslie would be 16½ miles long and of an average depth of about 10 feet. If we assume it to be on the average of a width of no more than 900 yards, the quantity of water stored is equivalent to 27,225 cusec-days.

Sir Bradford Leslie talks of the whole area of the Khadir being submerged by the proposed lake. This would involve an enormous area owing to

the great width of the Khadir, and artificial embankments to confine the lake to reasonable dimensions are essential, as otherwise nothing but continuous excavating would prevent the formation of mud flats, when the lake level was lowered and in addition the losses from evaporation and percolation would be too great to be compensated for by the flow in the river.

If, to supplement the supply for the generation of electrical energy, the lake is lowered by six feet, by drawing off the water (which is what is understood to be Sir Bradford Leslie's intention) the amount released would be 13,500 cusec-days, and, as it would not be safe to assume that this could be released in a shorter time than three months (*i.e.*, that the flow in the river might easily be in the neighbourhood of 100 cusecs for three months), the available flow from the storage to supplement the natural flow in the river would only be 135 cusecs. Under the most favourable conditions, and taking into consideration the maximum fall that can be obtained, the flow of water for the generation of electrical energy that could be relied on for commercial purposes would be only 235 cusecs, and the horse power obtainable only some 300. When the flow in the river increases, the horse power would of course be greater, but, for commercial purposes, the supply of electrical energy would have to be guaranteed, or intending consumers would fight shy of the scheme, and so the minimum supply is the basis for tackling the scheme on commercial lines.

When really large floods come down the river, the available fall would decrease so largely as to render the extraction of power from the water almost, if not quite, impracticable.

The effect on the régime of the river, and the adjoining country, of impounding the water has to be considered, as also the means required to preserve the régime. In the first place the Barari plain and much of the land behind the reclamation embankment on the east bank of the river would become a swamp owing to the height to which the lake is proposed to be pounded up, and consequently powerful pumping plant would have to be installed to remedy this defect in the case of the Barari plain and elaborate arrangements for draining the land on the east of the river into the Hindan river valley would be necessary in addition to the general filling up of this swamp by warping or mechanical means.

In the second place, even assuming that the weir is fitted with sluice gates, an absolute essential unless dangerous silting up of the whole bed of the river is to occur, the effect of the lake will be to decrease very greatly the velocity of flow of water entering the lake, and consequently silting up would occur. This phenomenon and the lines that it follows are well known to engineers versed in river training, and need not be enlarged on further than to state that, with the exception of the cunette, which is sufficient to carry the normal monsoon river, the rest of the bed of the lake would gradually silt up. Recent observations show that this cunette would be some 400 yards wide with a depth of some 12 feet. In the initial dredging of the river, this cunette would have to be created artificially to a more or less correct section (the river eventually correcting inequalities) and it is more than possible that dredging operations both to keep open this channel and to clear excessive silt from the bed of the rest of the lake would be not a temporary but a permanent arrangement. In this dredging of the river bed, and in the pumping out of the Barari plain, it is probable that the whole of the meagre 300 H.-P. created by the storage would be expended. In other words, the whole energy provided by storage would be expended in remedying evils, created by the storage; a fact which appears to put the possibility of the generation of electrical energy by the storage of water out of court. It appears indeed to involve the expenditure of capital and labour in the creation of a perpetual deadlock.

4. *Compensation for losses by evaporation and absorption.*—Turning now to the question of compensation for loss by evaporation and percolation, experience has shown that the evaporation losses will not be less than an average of $\frac{1}{4}$th of an inch per diem, and in the dry hot season (when incidentally the release of storage water, whether for the possible generation of electrical energy or for supplementing the supply of the Agra Canal, would be most imperative) the loss will be about $\frac{3}{8}$th of an inch. But taking the figure of $\frac{1}{4}$th of an inch the loss by evaporation over the lake proposed by Sir Bradford Leslie would be,

when the lake was quite full, 4,900,000 cubic feet per diem or 57 cusecs, and when the lake was lowered by draining off 6 feet of water, 3,267,000 cubic feet per diem or 38 cusecs.

Sir Bradford claims that, if the whole bed of the proposed lake lies over an impermeable layer of clay, the percolation losses will be practically *nil*. Certainly such a layer exists both at Chandrawal and at the railway bridge, and, if Sir Bradford's assumption is accepted that it probably extends over the whole area of the lake, the loss by percolation vertically downwards would undoubtedly be practically *nil*. But, at the same time, it is known that water, in the dry cycle of years, flows from the river into the subsoil and therefore there is a loss by percolation laterally. By raising the level of the water permanently this loss would undoubtedly be increased. What this loss would be is very difficult to say, but that it would be considerable there is no manner of doubt. These losses by evaporation and percolation would possibly be met by the impounding of the extra four feet above high flood level, but they would be a direct loss to the quantity of water, that could be released from storage for the purposes, which Sir Bradford Leslie contemplates.

5. *The value of the storage to the Agra Canal.*—Thirdly the possibilities of the storage as an efficient standby for supplementing the Agra Canal supply in times of scarcity may be discussed. It has already been shown that the whole lake provides a storage of 27,225 cusec-days. This figure has to be reduced by the evaporation and percolation losses, taken as four feet in depth of the lake amounting to 9,735 cusec-days, leaving a balance of 17,490 cusec-days.

The storage would therefore permit of some 175 cusecs being supplied to the Agra Canal continuously for three months assuming the lake to be completely emptied, or a larger flow could be given at intermittent periods, should that be more desirable, as, under the circumstances of irrigation in this part of India, would be more likely.

It should also be noted that water percolating laterally to the west would owing to the presence of rock westwards from Okhla, re-enter the river bed above the Okhla weir, while that percolating to the east would once more get back into the river bed partly above the Okhla weir, but, in all probability, mostly below the weir by way of the Hindan river. The percolation losses are not therefore dead losses though the evaporation ones are, but they are losses affecting the possibilities of the local lake as a storage lake.

It would seem therefore that the effect of pounding up the river would be to form a valuable storage for the Agra Canal as claimed by Sir Bradford Leslie. This claim appears to be substantiated.

6. *The water effect can be more conveniently got by designing to more appropriate levels.*—Having thus shown that the generation of electrical energy by the creation of a storage is not a practical scheme, it only remains to add that the advantages obtained by impounding the river, namely, the submersion of low-lying lands, at present a malaria nidus, and the forming of a supplementary supply for the Agra Canal, not to mention a water effect for the new Capital, can apparently be brought about by the construction of a weir with sluices across the river. The level of the water would have to be determined by consideration of the effects on lands adjoining the river and on the subsoil flow generally, and would, in all probability, be between R. L. 672 and R. L. 666 at the railway bridge, the former being a maximum, owing to the levels of the Barari plain. Where the low-lying lands are not sufficiently or possibly not at all submerged by a lake, pounded to some such level, it would be necessary to raise such low-lying lands above lake level to prevent the existing evils of a malaria nidus continuing in the future.

7. *The cost of the reclamation of the civil Bela and building site on the east bank.*—One of the points raised by Sir Bradford Leslie in propounding his scheme is the necessity of reclaiming 320 acres of land on the river side from Chandrawal to Selimgarh Fort. This it is proposed to carry out by dredging, and the creation of building sites and the formation of a lake side boulevard are formulated. This work is treated by Sir Bradford Leslie as being essential. It will be instructive therefore to consider what work this portion of the scheme would involve.

In the first place the area of 320 acres will have to be filled up to an average depth of some 12 feet, and this necessitates the shifting of six millions of cubic yards of material. Taking Sir Bradford Leslie's estimate of one shilling per cubic yard, the cost of this would be £300,000.

On the east bank, too, reclamation is necessary, and assuming that raising to a height of eight feet above existing ground level is adjudged sufficient, and that the width of reclaimed land is only 100 yards, then the amount of material to be shifted to make this reclamation some six miles in length would be some $2\frac{2}{3}$ millions of cubic yards at a cost of £167,000.

Sir Bradford Leslie, however, also contemplates the creation of a settlement for Indian subordinates on the east side of the river. The area required is one square mile and as such a settlement would have to be comparatively near the Government offices, only some three miles of the reclamation embankment could be used for that purpose, or 100 acres, so that some 500 acres more of artificially raised land would be required. This means the shifting of a further $6\frac{1}{2}$ millions of cubic yards at a cost of £325,000. In addition the reclamation embankment must be revetted, and even if this is done as cheaply as possible, taking the risk of possible scouring which may be considered permissible in view of the fact that the buildings would not be very valuable ones, the cost would not be less than £25,000.

But, in addition to this, on the west bank reclamation, a retaining wall on the lake side would be an essential, as otherwise scouring and undercutting by the river in high flood would endanger the stability of the reclaimed land and render it unfit for building sites or for the creation of a fine boulevard. Sir Bradford Leslie recognises the necessity for a stone-faced embankment. Such a retaining wall would have to be constructed on wells, founded on the clay substratum; unless this work were very soundly built the danger from scouring to the valuable buildings would be too great to be contemplated. The cost of such a retaining wall, with its superstructure forming an ornamental balustrade along the boulevard, would amount to some £450,000.

In fine, the absolutely necessary work, excluding all question of further desirable reclamation, would cost not less a sum than £942,000. This does not include the cost of the weir and training works below the bridge. While, if further reclamation for the purposes of a settlement on the east bank is made, the additional cost would be £325,000.

The cost of the reclamation of the 320 acres on the west bank would be £750,000. This is equivalent to an outlay of over Rs. 7-4-0 per square yard or nearly ten shillings, and this is the cost over the whole area, including roads, open spaces, etc., so that probably the cost for actual building sites would be nearer Rs. 30 or £2 per square yard.

As Sir Bradford Leslie states that the weir must be first constructed to give sufficient depth for the dredgers to be floated, it is clear that this reclamation cannot proceed *pari passu* with the construction of the buildings of the new city, but must await the completion of the weir. In other words the weir is an essential feature of Sir Bradford Leslie's scheme on all grounds and is the first item of construction to be proceeded with.

8. *A bridge will be required to supplement the motor launches.*—Communication with the suburb on the east bank is to be by covered motor launches plying between piers; this assumes that it will never be necessary to lower the lake below a navigable depth, a contingency that must frequently occur if the storage is to be of any value to the Agra Canal, and therefore communication by a suitable bridge should be added to the cost of the development of a building area on the east bank.

GEORGE S. C. SWINTON,
Chairman.

JOHN A. BRODIE,
EDWIN L. LUTYENS,
} *Members.*

EXPERTS' CAMP, DELHI,
Dated 11th March 1913.

ACCOMPANIMENT

TO

SPECIAL REPORT

OF THE

DELHI TOWN PLANNING COMMITTEE

ON THE

POSSIBILITY OF BUILDING

THE IMPERIAL CAPITAL

ON THE

NORTH SITE.

LIBRARY OF THE BOMBAY BRANCH OF THE ROYAL ASIATIC SOCIETY

REFERENCES.

- Reduced area required for the Imperial Capital on either North or South site.
- Extended area required for the Imperial Capital on South side only.
- Area within 5 feet of flood level of the River.
- Area 5 feet below flood level of the River.
- Area more than 5 feet below flood level of the River.
- Projected Channels of communication connecting site on South with existing city and its environs.

DELHI AND VICINITY

Season 1910-11

Mean Magnetic Declination 2° 15′ East (in 1911)
(Decreasing by 1′ annually)

77° 6′ 10′ 15′ 16′ 77°
28° 45′ 28°

40′ 35′ 30′

UNSATISFACTORY FOR BUILDING PURPOSES

RESERVED FOR EXTENSIONS

UNSATISFACTORY FOR BUILDING PURPOSES

CITY EXTENSIONS

ISOLATION ZONE

MILITARY RAILWAY PURPOSES

CANTONMENT

DELHI

Sahibabad Daulatpur · Shamapur Alamgirpur · Subhepur · Jagatpur · Mukandpur · Bhalswa Jahangirpur · Jharoda Mazra Burari · Amphitheatre · Wazirabad · Babli · Haidarpur · Rithala · Pipal Thala · Nihalpur · Bharaula · Azadpur · Malakpur · Dariapur · Bhaka · Nahar Wangu · Magazine · Native Cavalry Lines · Ridge · Cemetery · Chandrawal · Tees · Flagstaff Tower · Pumping Station · Metcalfe House · Civil Lines · Ridge · Sabzi Mandi · Rochanara Gardens · Smoke Pillar · Mutiny Memorial · Kishanganj · Rocky Ground · Sadr Bazar · Shidipura · Karaul Bagh · Pahargunj · Kalan ka Bagh · Raja ka Bazar or Jaisinghpura · Jail · Darya Ganj · Khairati Gate Native Infantry Lines · Firozabad · Indarpat · Burari Hills · Shah Maulg · Sarban Sarai · Babarpur Bazidpur · Rakab Ganj · Zabtaganj · Narbaula · Rail Sidg · Nangal Raya · Shahpur · Malcha · Katwaria Sarai · Tal Kot · Mahrauli · Lado Sarai · Jahanpanah · Shah Sarai · Begampur Sarai Shahji · Adh Chini · Tut Sarai · Khirki · Sikandar Lodi · Nizam-ud-din · Humayun's Tomb · Nizampur · Bahlolpur Bangar or Sarai Kale Khan · Sarai Balak · Aliganj · Bibipur · Gate Sarai · Mubarakpur Kotla · Masjid Moth · Siri · Shahpur Jat · Chiragh Dehli · Kila Rai Pithora · Tughlakabad · Tughlak Shah's Tomb · Zafarabad · Deoli · Nib Sarai · Khanpur · Tigri · Madangir · Kilokri · Okhla · Jasola · Sagarpur · Nawadah Bagar Nagar · Ahmadalpur · Pehladpur Mazra Palam · Shahjahanpur Kotla · Manakpur Basant Nagar · Mangalpuri · Pehladpur Mehram Nagar · Muradabad Pahari · Munirka · Mehpalpur · Malakpur Kohi · Tomb of Sultan Ghari · Masudpur · Rajokri · Chhatarpur · Ber Sarai · Quarry · Kasumpur · Jharera · Arakpur Baghmochi · Jawahirpur · Nangal Dewat · Palam · Gurgaon Civil Stn 6 m · Gurgaon Civil Stn 9 m · Rohtak 37 m · Wanglol Jat 2 m · Hasht Sal 3 m · Najafgarh 7 m · Pahladpur Bangar 2 m · Puth Kalan 1 m · Pahladpur Bangar 1 m · Loni 1 m · Loni 5 m · Ghaziabad 10 m · Faridabad 11 m · Hasht Sal 1 m

Sabzi Mandi · Rochanara Gardens · Smoke Pillar · Mutiny Memorial · Kishanganj · Rocky Ground · Sadr Bazar · Shidipura · Karaul Bagh · Pahargunj · Kalan ka Bagh · Raja ka Bazar or Jaisinghpura · Jail · Darya Ganj · Khairati Gate Native Infantry Lines · Firozabad · Indarpat · Burari Hills · Shah Maulg · Sarban Sarai · Babarpur Bazidpur · Rakab Ganj · Zabtaganj · Narbaula · Rail Sidg · Nangal Raya · Shahpur · Malcha · Katwaria Sarai · Tal Kot · Mahrauli · Lado Sarai · Jahanpanah · Shah Sarai · Begampur Sarai Shahji · Adh Chini · Tut Sarai · Khirki · Sikandar Lodi · Nizam-ud-din · Humayun's Tomb · Nizampur · Bahlolpur Bangar or Sarai Kale Khan · Sarai Balak · Aliganj · Bibipur · Gate Sarai · Mubarakpur Kotla · Masjid Moth · Siri · Shahpur Jat · Chiragh Dehli · Kila Rai Pithora · Tughlakabad · Tughlak Shah's Tomb · Zafarabad · Deoli · Nib Sarai · Khanpur · Tigri · Madangir · Kilokri · Okhla · Jasola

REFERENCES TO DELHI

	CIVIL LINES
1	The Mound
2	Telegraph Office 1857
3	Ludlow Castle (Delhi Club)
4	Malden's Hotel
5	Cecil Hotel
6	Cemetery
7	Nicholson Gardens & Statue
8	Police Lines
9	Sammy House
10	Sammy House Battery
11	No 1 Battery Right 1857
12	do Left
13	No 2 do Right
14	do Left
15	No 3 do
16	No 4 do
	CITY
17	Water Bastion
18	Kashmir Gate
19	Mori Gate
20	Mori Bastion
21	Spot where Genl Nicholson fell
22	Delhi Sadr RS
23	Lahore Gate
24	Ghazi Khan's Tomb
25	Ajmer Gate
26	Shah Tank
27	Turkoman Gate
28	Dehli Gate
29	Kali Masjid
30	Sonahri Mosque
31	Victoria Hospital
32	Fatehpur Mosque
33	Golden Mosque
34	Queen's Gardens
35	Old Magazine
36	St James' Church
37	District Courts
	FORT
38	Lahore Gate
39	Dehli Gate
40	Naqqar or Naubat Khana
41	Diwan-i-Am
42	Diwan-i-Khas
43	Moti Masjid or Pearl Mosque

Railways - 5′6″ Gauge: Double Line. Single Line
" Other Gauges: Double Line. Single Line
Mineral Lines and Tramways. Telegraph Line
Main Roads: Metalled, with Mile-stone. Unmetalled
Cart-track. Camel-track or Trade-route
Mule-path, with Pass symbol. Foot-path
Wells: Masonry lined. Unlined
Fort. Watch-tower. Deserted Village. Mine
Temple. Mosque. Graves. Pongyi Kyaung

Published under the direction of Colonel S. G. [illegible]

Furlongs 8 7 6 5 4 3 2 1 0 — Scale 2 Inches

Contour [illegible]

Contours and Chinometric heights are approximate.
Forest and jungle are coloured green, cultivation yellow.

77° 6′ E. OF GREENWICH

[illegible]rand, C.S.I., R.E., F.R.S., Surveyor General of India,
912.

1 Mile or 1: 31,680. 2 Miles

Intervals 50 feet.
Those portions of rivers, streams, canals, lakes, &c. which generally contain water are shown in blue.

Boundary: External of India, with pillar
" Province or State. Ditto undemarcated
" Division. District
" Sub-Division. Forest Reserve
Limit of Cultivation. Camping Ground CG
Trig. Station or Point. Levelled Bench Mark. △ Shalli B M 355·04
Heights: Trigonometrical: Chinometric. Relative 1539 1523 15r
Post & Telegraph Offices. P.O. & T.O. combined. Police Stn. PO TO PTO PS
Dak & Inspection Bungalows. Rest House. Circuit House DB IB RH CH

Report of the Committee appointed under the orders of His Excellency the Viceroy to report upon the comparative healthiness of the proposed northern and southern sites for the new Imperial City of Delhi.

1. In accordance with the wishes of His Excellency the Viceroy, conveyed in a letter from the Private Secretary to the Viceroy, dated 25th February 1913, this Committee has been convened to consider the comparative healthiness of the proposed northern and southern sites of the new Imperial Capital at Delhi.

2. We have carefully inspected both sites; have perused the records and reports bearing on the question at issue; and have consulted the officer in charge of the malarial survey of Delhi Province.

3. After mature deliberation we wish to express our general concurrence in the conclusions arrived at in the two reports submitted to His Excellency the Viceroy by the Town Planners. These reports deal fully with the physical features of both the northern and southern site, the chief of which, from the medical and sanitary point of view, are the space available for building purposes, the liability to flooding, the nature of the soil, the height of the subsoil water and the tendency to water-logging. These points we will now proceed to discuss in detail.

4. In order that the new Imperial city may be built on the northern site it is necessary to reduce its area to approximately five square miles. This, in our opinion, is the absolute minimum space upon which you can start planning the Imperial city, and we fail to see where even this minimum amount of suitable ground can be found on the northern site. The total area of land lying to the east of the Grand Trunk Road, which is not at present developed and which is at a level not liable to periodical flooding, is four square miles. From this estimate we exclude the southern portion of the Ridge, the parks, cemeteries, Civil Lines, the open land outside the city walls, and all land which will require raising and consolidation before it can be built upon. A further addition of about 2¼ square miles can be obtained by the inclusion of the last named area, together with the Civil Lines and the *bela* north of the Railway bridge. The civil *bela*, however, is at present uninhabitable and would require to be reclaimed. It will be seen, therefore, that assuming that it is possible to build the city on this area, there is not sufficient room for internal and external expansion. Moreover, even if it were possible to make the proposed site healthy, it will still remain in dangerous proximity to the malarious swamps of the Barari plain, the low-lying portions of which would require to be raised to extents varying from 8 to 11 feet, for at least half a mile from the margin of the inhabited area. Assuming that this could be accomplished at a reasonable cost, regarding the possibility of which we entertain grave doubts, this area would be required as a protective zone and would not be available for building purposes.

The major portion of the proposed northern site, excluding the Civil Lines and the *bela* area requiring reclamation, consists of a cold sour clay; heavily water-logged In the opinion of the Committee this water-logging is mainly the result of many years of super-saturation from irrigation and we consider that even if by stoppage of irrigation and by the diversion and improvement of existing drainage lines the level of the subsoil water were lowered to a certain extent, the soil would still remain, from the health point of view, unsatisfactory for building purposes. We are of opinion that there would be grave risk of excessive sickness from rheumatic affections and diseases of the respiratory system, including tuberculosis, which is already becoming such a serious problem in urban areas all over India. Moreover, owing to the dampness of the site, this area, during the cold weather months, would be subject to heavy mists in the evenings and early mornings, and this would further increase the dangers from the diseases noted above. On the other hand, the soil on the southern site is a good agricultural loam, light and porous in character. It is not water-logged, and the drainage, both superficial and underground, is good.

5. The Committee submits two maps, prepared by the officer in charge of the malarial survey of Delhi Province.* These show a very striking difference as regards the malarial endemicity of the two sites as shown by the percentage of enlarged spleens amongst the children residing in the villages in the respective areas and also by the relative distribution and prevalence of the two most dangerous species of malaria carrying mosquitos, *viz.*, *M. Culicifacies* and *Ne. Stephensi*. It will be seen that whereas in the northern area the average percentage of enlarged spleens reaches the very high figure of 65, in the southern area it is only 23. It may also be noted that the splenic index is fairly regular over the whole of the northern area showing a general infection throughout, whilst in the southern area there is a very marked and definite decrease in the splenic index as one gets away from the numerous excavations on the borders of Delhi city. Regarding the distribution of mosquitos in the two areas, it will be observed that the breeding grounds on the northern site are very much more widespread and regularly distributed. Apart from the Najafgarh drain, the canal and the nullahs leading down to the river Jumna, they consist of extensive swamps and pools which would be extremely difficult to deal with effectively on account of the tendency to flooding, the general water-logging, defective drainage and the stiff retentive nature of the soil. The attached photograph, showing a pool in the vicinity of Dahirpur village, represents the normal monsoon conditions over a large portion of the northern area

In the southern area, on the other hand, the chief breeding grounds consist of the Okhla navigation cut, kankar pits, brickfield excavations, wells and bunds across small nullahs. These are all artificial conditions and can be remedied without difficulty.

A further point of importance, and one which accounts largely for the smaller prevalence of malaria in the southern area, deserves consideration. An examination of the natural distribution of the different varieties of mosquitos in the two areas shows that in the southern area the proportion of dangerous to non-dangerous varieties is far lower than in the northern. Thus, while of a total number of mosquitos captured in the northern area 34 per cent. belonged to the dangerous species of *M. Culicifacies* and *Ne. Stephensi*, in the southern area only 20 per cent. were included in this category.

6. The mortality statistics of the villages in both areas are very defective and show many omissions but, assuming that the percentage of error is the same in each case, the average mortality over a period of five years works out at 15·1 per mille per annum for the southern area and 46·0 for the northern. These figures are in agreement with what one would expect from the malarial conditions noted in the previous paragraph and shown in the accompanying maps. They may therefore be taken as a reasonably accurate gauge of the conditions existing in the two areas.

7. The Committee presumes that if the new Imperial City is built upon the northern site, it will be necessary to provide a location for troops close to the Capital. No such location appears to be available within the area now under consideration without placing either the troops or some of the Indian population upon extremely undesirable land.

We have already indicated the effect of such a location upon the civil population. It is reasonable to suppose that the effect upon troops would be similar.

8. In order to secure the healthiness of old Delhi, whatever site may be adopted for the new Imperial city, the river Jumna must be trained to flow within certain definite limits so as to avoid the formation of shallows and pools, and it will be necessary to deal with the whole river frontage; but from the medical and sanitary point of view we are not in favour of Sir Bradford Leslie's scheme for the creation of an artificial lake above the Railway bridge. In our opinion, Sir Bradford's proposal will have no effect whatever upon the incidence of plague. On the other hand it will intensify the adverse conditions already prevailing upon the northern site.

* "These two maps were subsequently consolidated on one sheet."

9. In conclusion, the Committee, after giving full consideration to the various points discussed in the above note, is bound to advise the Government of India that no doubt can exist as to the superior healthiness of the southern site, the medical and sanitary advantages of which are overwhelming when compared with those of the northern site.

C. P. LUKIS.

H. T. KEELING.

J. C. ROBERTSON.

DELHI ;
4th March 1913.

Season 1910-11

DELHI AND VICINITY

Mean Magnetic Declination 2° 15' East (in 1911)
(Decreasing by 1 annually)

EAST INDIA (DELHI).

FINAL REPORT

OF THE

DELHI TOWN PLANNING COMMITTEE

REGARDING THE SELECTED SITE.

WITH PLAN AND TWO MAPS.

Presented to both Houses of Parliament by Command of His Majesty.

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Letter from the Government of India to the Most Honourable the Marquess of Crewe, K.G., His Majesty's Secretary of State for India, No. 12, Home (Public), dated Simla, the 1st May, 1913.

WITH reference to previous correspondence we have the honour to forward for your information the final report of the Delhi Town-planning Committee on the town-planning of the new imperial capital. We have considered the report, and desire to say that we accept its conclusions generally as a useful guide in our further operations. There are, however, many details which will require very careful examination before execution, and we feel that we must exercise our discretion in dealing with them. It may be necessary to defer the carrying out of some of the projects and to modify others in accordance with future necessities as they arise.

We have, &c.,

(Signed) HARDINGE OF PENSHURST.
GUY FLEETWOOD WILSON.
HARCOURT BUTLER.
S. A. IMAM.
W. H. CLARK.
R. H. CRADDOCK.
E. D. MACLAGAN.

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To

HIS EXCELLENCY THE VICEROY
AND GOVERNOR GENERAL OF INDIA.

Delhi, 20th March 1913.

YOUR EXCELLENCY,

I have the honour to present the final report of the Delhi Town-Planning Committee on the town-planning of the New Imperial Capital. A plan of the lay-out is enclosed.

I have the honour to be,

Your Excellency's obedient servant,

GEORGE S. C. SWINTON, *Captain*,
Chairman, Delhi Town-Planning Committee.

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FINAL REPORT ON THE TOWN PLANNING OF THE NEW IMPERIAL CAPITAL.

1.—Preliminary.

The Committee now propose to present the separate report on town planning which was promised in paragraph 1 of their report on the choice of a site for the new Imperial capital at Delhi.

In accordance with the programme detailed in the concluding paragraph of that report the Committee left Simla in the latter half of June. Mr. Brodie was the first to leave and on his way home visited Delhi, where he went over a portion of the ground. Captain Swinton and Mr. Lutyens left Simla a few days later and met Mr. Lanchester at Delhi. They had the advantage of learning his views and discussing plans with him before leaving for Europe.

From August to November the Committee were in England, but kept themselves continually in touch with India. Lengthy communications passed by every mail: and while certain work was carried out by the Committee at home, the officers at Delhi conducted the necessary investigations on the spot.

The whole railway problem was reviewed. The question of the afforestation of the ridge was considered. Arrangements were made for the rearing of suitable trees and plants for the avenues and parks of the new city. An elaborate preliminary estimate of the cost of the new city was drawn up by Mr. Ward and Mr. deMontmorency, ably assisted by Captain Roberts, Captain Sopwith and Mr. Parker. These preliminary estimates covered the ground of the cost of land, storm water drains, sewage and sanitary installation, irrigation, domestic water supply, roads, parks, buildings, lighting, tools and plant and establishment. The acquisition of land for the new site began.

During the interval there was one fresh development. In paragraph 10 of their report the Committee recommended the acquisition of the suburb of Paharganj, and in a tentative lay-out, which they put forward, it was condemned for demolition. On the receipt of the estimates of the land acquisition officer it was discovered that this suburb, although admittedly of poor character and appearance and insanitary, contained 15,000 inhabitants and was valued at a very large sum. This discovery raised serious complications; and the Committee were informed that the Government of India did not see their way to sanction its immediate demolition. It was held that it would be easier to deal with this area by including it in a general scheme for the improvement of the present city, the expenditure being spread over a number of years. The Committee were accordingly instructed to consider the possibility of aligning the main axis of their lay-out in a more easterly direction.

The Committee realise that the compulsory removal of great masses of population is a difficult matter requiring much care and tact; but they received with regret the news that Paharganj must remain for the present. It is to-day a poor class property; but it occupies such an advantageous position that it must rise in value. In the opinion of the Committee it would be wiser for the Government of India to obtain such control over it that no private interests can be created in it detrimental to the public welfare. The Committee would wish again to emphasise the vital importance of control of which mention was made in paragraph 10 of their earlier report.

Captain Swinton returned to Delhi on November 25th. Mr. Brodie and Mr. Lutyens did not arrive till nearly a month later. At the desire of His Excellency the Viceroy they visited Mandu, Indore, Lucknow and Cawnpore on their way from Bombay to Delhi. Since then the work has been continuous.

2.—A special report on the north site.

Towards the end of January the attention of the public was directed to the north site, or Durbar area, as a site for the new capital. This interest was evoked partly by a paper read by Sir Bradford Leslie before the Society of Arts in London and partly by a series of articles in the press from champions of this site. In paragraph 7 of their report on the choice of the site the Committee had already concluded that it was impossible to provide an area on the north site to suit the requirements of the new capital as communicated to them by the Government of India. The only possible basis, on which the question could be considered, was a modification of the conditions originally laid down. At the desire of His Excellency the Viceroy the Committee proceeded to review the conditions of size and area originally postulated by the Government of India and presented a separate report on the possibility of accommodating a city of half the size previously contemplated on the northern area.

3.—Principles to be kept in view.

There are certain general principles governing town planning in all countries and climates, though they must vary with the motif of the city. First and foremost among these the Committee put the need of foresight. There must be a readiness to meet every requirement of the future. Whatever eventualities the days to come may have in store, the new city must have at its hand the inherent power to command health, and a wealth of air spaces and room for expansion, which no lapse of time can deplete. A well-planned city should stand complete at its birth and yet have the power of receiving additions without losing its character. There must be beauty combined with comfort. There must be convenience—of arrangement as well as of communication. The main traffic routes must be parkways capable of extension both in width and length. Communications both internal and external should be above reproach. Where possible, there should be a presentation of natural beauties—hill, wood and water—and of monuments of antiquity and of the architectural splendours of modern times. Space is needed for recreation for all classes. The result must be self-contained yet possessing a latent elasticity for extension. The perfected whole should be obtainable with due regard to economy.

To all this must be added the special principles governing the town planning of a particular site. In the case of Delhi the Committee conceive the chief of these to be a realization of the dominant idea of the new Delhi and the adaptation of the scheme of the new city to physical conditions. Delhi is to be an Imperial capital and is to absorb the traditions of all the ancient capitals. It is to be the seat of the Government of India. It has to convey the idea of a peaceful domination and dignified rule over the traditions and life of India by the British Raj. The attention to be paid to physical conditions chiefly centres on making the new city one suited for a seven months' residence in a climate which varies during that period from a maximum shade temperature of 105 degrees Fahrenheit to a minimum winter shade temperature often approaching freezing point. Health in a land with a bad malarial record and violent variations in climate, rainfall and river flood levels has to be most specially safeguarded. The local drawbacks of dust, glare and barrenness have to be combated ; and the provision of irrigation, without which no grass or trees can grow successfully in Delhi, must be arranged. The Committee now propose to show how their lay-out on the south site is governed by these principles.

4.—Description of the south site.

The general description of the south site, which was given in paragraph 9 of the report on the choice of a site, may now be presented in greater detail with a view of showing clearly how the lay-out on such a site can fulfil those principles which the Committee have set for their standard.

Situation.

(*a*) The site of the proposed new city may be said to begin from the walls of the present city of Delhi and to extend from them in a southerly and south-westerly direction. On the eastern side the area will extend to the Jumna. The old high bank of the river on which are situated the remains of the cities of

Ferozshah Kotla and Indrapat and the buildings in the vicinity of Humayun's tomb, is far away from the present channel of the river from which it is separated by a considerable expanse of low-lying land locally known as the *Bela*.

On the west the natural limit of the area is the ridge. A cross-section of the ridge opposite Paharganj shows a rocky surface at an elevation of about 725 feet above mean sea level, rising to about 800 feet at the highest point and falling again to about 750 feet in a total width of 1,200 yards before the rock surface again disappears beneath the soil. The ridge continues southwards at the same apparent width, but gradually rises in height to a maximum of 865 feet at a point west of Tal Katora. A line drawn from this point to Safdar Jang's tomb and then due east to the river forms roughly the present southern boundary of the land required, though the tract southwards of this line is in every way suitable for building and will be available for expansion.

The size of the site.

(*b*) The total area described as the site has a width of about 4½ miles at its broadest part at the proposed southern boundary and narrows as it approaches the present town to a width of about 2½ miles. The village of Malcha at the south-west corner of the site is 3½ miles from the Ajmere gate of Delhi city while Nizamuddin's tomb at the south-east corner is 3¼ miles from the Delhi gate. If however it is considered necessary to adopt a restricted lay out of the nature considered in connection with the north site, the whole of this area will not be occupied by buildings at once but will be developed gradually.

The older Delhis.

(*c*) Looking from the centre of the site towards the river there is Shahjehan's Delhi on the left, and following down the river frontage Ferozshah's Delhi, Indrapat and Humayun's tomb fill the outlook in front, while outside the site itself Tughlakabad, Siri, Jehanpanah, Kila Rai Prithora, Lal Kot and the Kutb complete the panorama. The isolated buildings known as Safdar Jang's tomb, the Lodi mausoleums and the observatory of Jey Singh are within the site itself; the only portion of the older cities which lies within the boundaries of the site is an area of about 1½ square miles starting on the west near the Turkoman gate of the present city and extending southwards from the Delhi gate to the edge of the old high river bank. This area is unoccupied by buildings at present, but much of it is rough and uneven with the scattered remains of the stones and foundations of old settlements. It will best be utilized partly for large institutions which require a considerable area of land around them and partly by being planted and treated as a natural wild park.

The unoccupied area.

(*d*) All the rest of the site with this exception consists of good land most of which is in continual use for agricultural purposes. The area has been largely cleared of trees so as to allow of unrestricted tillage; but it grows excellent crops, and where the villagers have allowed occasional trees to remain near a village site or mosque or in a walled garden the excellence of the tree growth is an earnest for the success of the avenues and parks in the new city. In a few places near to the present city the land has been spoilt by use of the underlying materials for brick burning; but it will not be difficult to bring these areas up to the level of the surrounding land before they are required for building purposes. The Committee have twice seen the ground under a smiling expanse of crops and feel the greatest confidence in the good qualities of the soil for the purposes of gardens, parks and arboriculture generally. This opinion is shared by Mr. Griessen, an expert landscape gardener who inspected the site.

The general fall of the country.

(*e*) The natural fall of the country is at right angles to the base of the ridge and towards a shallow valley on the eastern boundary of the site; this valley falls in a southerly direction past the village of Kilokri and has its outlet into the river near Okhla. The Committee could wish for nothing better. The whole of the natural surface falls are very favourable for the disposal of sewage and storm water. From observations taken in September last, when a heavy fall of rain occurred amounting to eight inches in 12 hours, it appeared that the nullas or ravines connecting with the main valley were dry again within a period of eight hours from the time the rain ceased.

Variations in the plain.

(*f*) It must not be supposed however that beside the ridge the only feature is a plain with a gentle slope to the south-east. Within the proposed area there are a number of places where the land or rocky eminences rise considerably above the surrounding surfaces. At Ugar Sain's Baoli there is a small plateau rising to a height of 720 feet. A rocky hillock at Raisina village, which is the

approximate centre of the building area, rises to 750 feet or about 40 feet above the country immediately surrounding it. A long ridge of high ground varying in height up to 760 feet surrounds on three sides a lower area of land lying to the south-west of the village of Kushak. A number of projecting ridges also outcrop between the western boundary of this hollow and the village of Malcha extending northwards at various altitudes generally above 750 feet towards the village and garden of Talkatora. These are a series of spurs from the main ridge itself. These variations make a pleasing break in the general level of the plain and offer great opportunities for advantageous town planning and the placing of important buildings.

The Main Ridge.

(*g*) The main ridge, a continuation of the historic Ridge on the north, starts from a suburb called Sadar Bazar, and stretches in a south-westerly direction. Its surface consists largely of bare quartzite weather worn rocks of a reddish colour rounded in contour, lying between vertical beds of some thickness. Many individual stones are of considerable bulk. Between the tilted layers of rock, and in pockets between stones, small patches of soil are to be found which support shrubs and bushes and throw up grass in the rainy season. At present the ridge is heavily grazed by numerous flocks of goats and sheep, and vegetation has little chance of successful existence. Here and there in the surface above Talkatora gardens and in other places, considerable areas of soil have accumulated in local depressions. A scheme has now been drawn up by an experienced forest officer for the afforestation of the ridge. This scheme provides for rough terracing to hold up soil and skilful treatment of the watercourses down which the surface waters escape. Irrigation to start arboriculture is possible from the drinking water-supply which will be delivered at a high level along the crest. It is anticipated that the stoppage of browsing will in itself conduce to the rapid growth of much natural wild vegetation, while the skilled arboricultural operations of the afforestation scheme will result in a complete reboisement of these hills. The lay-out provides for the construction of ridge drives along the higher portions which will be connected through to the existing roads on the north Ridge, by a thoroughfare constructed through the Sadar Bazaar. The views from these high drives will be magnificent. The panorama of the present city, the new city and the monuments and cities of the past stretching below to the river as seen from the rough eminence past a foreground of rocks and trees should be one difficult to match for charm.

Physical conditions in relation to health.

(*h*) The villages on the site have, as compared with those in other areas near Delhi, a good past history in the matter of health. Where there has been malaria, it has been due to a localised cause such as the ponding up of storm water by artificial embankments for agricultural purposes or to local depressions which gave an opportunity for anopheline breeding. These local defects will disappear on the development of the site for the purposes of the new city. In other respects the site is excellent from the point of view of health. The subsoil water gives no cause for anxiety. The soil is a fine permeable loam. The slope for drainage of storm water or sewage is excellent. The site is sheltered from the cold north-west winds in the winter. The part of the site which will be closely built over is at a distance from any flooded areas and is free from water-logging.

The Cantonment area.

(*i*) To the south-west of Malcha, but on the other side of the ridge, lies the tract which has commended itself to the military authorities as being the area most eminently adapted for the purposes of a cantonment in the vicinity of Delhi. This offers wide expanses suitable for manœuvres and is a healthy site open to the wind in the warm season—a necessity for a station which will be occupied all the year. This area is most conveniently situated in regard to the proposed site for the new capital, as near Malcha the configuration of the ground makes it possible to provide without difficulty connecting roads with easy gradients between the two settlements.

Communications.

(*j*) The nature of the site is such that there is a possibility of the freest communication everywhere to the south for purposes of expansion. To the north there is no obstacle in communication with the Ajmere, Turkoman and Delhi gates of the present city, which are the three important gates in the south wall. On the east communication to the banks of the Jumna is everywhere unrestricted. To the west there are good means of communication with the

cantonment area to the south-west, and with the present city and civil lines to the north-west.

This amplification of the description of the site will, it is hoped, make it clear how far both time and nature have combined to secure on the south site the realization of many of the principles which the Committee had set up to be their guiding influence in planning the new capital. Time has stored up for the new city those splendid monuments of ancient empires and cities to convey the legacy of history and the imperial tradition. Nature has provided a varied scene of ridge and river, of plain and hill. Nature too has supplied that wide area for expansion, that facility of communication, and that excellence of soil and slope which give the potentiality for convenience and health. It now remains to set forth in what manner the Committee recommend that these gifts should be used in order to attain the consummation of the rest of their principles.

5.—Description of the lay-out.

The central point.

(*a*) The central point of interest in the lay-out, which gives the motif of the whole, is Government House, the Council Chamber and the large blocks of Secretariats in which the Members of the Governor-General's Council administer the great departments of Government. This is the keystone of the rule over the Empire of India; this is the place of Government in its highest expression; this is the seat of the Governor-General in India and his Council.

This Governmental centre has been given a position at Raisina hill near the centre of the new city. This will be the centre of its life. So placed it commands views of the new city on every side and is viewed by all the inhabitants thereof. There is a wide outlook over its demesne—ridge, river and plain, the Delhi of to-day and the Delhis of the past.

Advantage is taken of the height of this hill and it is linked with the high ground behind so as to appear a spur of the ridge itself. Behind the hill a raised platform or forum would be built. This will be flanked by the large blocks of secretariat buildings and terminated at its western end by the mass of Government House and the Council Chamber, with its wide flight of steps, portico and dome. Thus the imagination is led from the machinery to the prime moving power itself.

The forum will be approached by inclined ways with easy gradients on both its north and south sides. The main access to it is from the east. The axis of the main avenue centres on the north-west gate of Indrapat nearly due east of Government House.

The reasons for siting on Indrapat.

(*b*) Looking from the eastern end of the forum where the broad avenue enters the Governmental centre and where the great stairways are set, the view is towards the east. The height and mass of the Secretariats, with the dominating influence of Government House and the Council Chamber behind them to the west, look towards Indrapat, the site of the oldest of all the Delhis. It was on this too that Shahjehan faced the Delhi gate of the Fort and the Delhi gate of Shahjehanabad. Right and left the roadways go and weld into one the empire of to-day with the empires of the past and unite Government with the business and lives of its people.

The general lay-out.

(*c*) Behind Government House to the west would be its gardens and parks flanked by the general buildings belonging to the Viceregal estate. Beyond these again on the ridge itself would be a spacious amphitheatre to be made out of the quarry from which much of the stones for roads and buildings may be cut. Above this and behind it will lie the reservoir and its tower which will be treated so as to break the sky line of the ridge.

To the east of the forum, and below it, will be a spacious forecourt defined by trees and linked on to the great main avenue or park-way which leads to Indrapat. This forecourt might be adorned by fountains and contain decorative features emblematic of the various provinces of the Indian Empire.

Across this main axis, and at right angles to it, will run the avenue to the railway station. This will terminate in the railway station, the post office and business quarters at its northern end, and in the Cathedral at its southern extremity.

To the south-east will lie the park area in which stand the ancient monuments of Safdar Jang's Makhbara and the Lodi tombs. This area can be developed gradually as the city expands and has need of public institutions of various kinds. The axis running north-east from the secretariat buildings to the railway station and towards the Jama Masjid will form the principal business approach to the present city. At the railway station a *place* will be laid out around which will be grouped the administrative and municipal offices, the banks, the shops and the hotels. On this *place* the post office is placed in symmetrical relation to the railway station.

Processional route.

(*d*) The processional route will lead down from the railway station due south to the point where it is intersected by the main east to west axis. Here round a *place* will be gathered the buildings of the Oriental Institute, the Museum, the Library and the Imperial Record Office which will form what may be termed a centre of intellectual interest.

As an alternative a longer processional route can be used as the city developes, which will lead out from the Delhi gate of the Fort past the Delhi gate of the city, through the city park, south along the area occupied by the residences of the Indian Chiefs and Nobility. Before it reaches Indrapat it will be deflected to the commemorative column in the main park-way which goes west from Indrapat to the forum. The procession past the villas of the Chiefs with the views of the Jumna and Indrapat will combine to make this route one of peculiar interest.

Suburbs.

(*e*) To the south-west of the railway station will lie the houses of the local administration and the residences of the European clerks.

Between Talkatora garden and Paharganj will be the area proposed for allocation to the Indian clerks, the press and other Government establishments.

Due south of the forum the residence of His Excellency the Commander-in-Chief will be placed. Round about the Viceregal estate and the forum lies the ground destined for the residences of the Members of Council, the Secretaries and other officials of the Government of India.

To the south-west of Government House lies the club in a position easily accessible from the two main roads to cantonments and the avenue of the residential part of the city. To the south of the club a low ridge divides the tract into two portions. That to the west is well adapted for a golf-course, while the eastern side is designed for a race-course, the ridge itself offering unusual facilities for locating stands and seeing the races.

Jantar Mantar.

(*f*) The fire station with its tower will be built to balance the lofty observatory buildings of the Jantar Mantar in the position shown on the plan.

Avenues.

(*g*) The avenues range from 300 feet to 60 feet with the exception of the main avenue east of the Secretariat buildings where a park-way width of 440 feet has been allowed. The widths of the avenues depend on the varieties of trees selected. In all main avenues it is proposed to arrange for running water with fountains at intervals as features. The principal avenues in addition to the main avenues are those running at right angles to the main east to west axis. Others form part of a system running from the amphitheatre to the railway station and Commander-in-Chief's residence, and from both the latter to the commemorative column. These enclose the imperial centre and are the outer main sinews of the frame. The commemorative column lying on the axis between Indrapat and Government House is the focal point of the roads and avenues on the park-way. A ridge drive as shown on the plan will be laid out and its treatment is suggested by the construction of an approach to the Baoli Bhattiara along the adjoining masonry embankment.

Connections with the city and cantonment.

(*h*) Communications with the present city and Civil Lines will be by way of the avenue towards the Jama Musjid.

Inside the city this bifurcates, one branch leading towards the King Edward Memorial while the other goes north towards St. James' Church and the Kashmere gate. The present civil station and the new city will also be connected by broad roads running through the Sadr Bazar. Other communications appear on the plan. Communication with the Cantonment will be

established by roads from the Military settlement joining both the ridge road and the existing road from Delhi to Gurgaon.

(*i*) In laying out avenues and compounds it is essential that the design of the buildings and the actual lay-out of entrances to compounds should be determined before trees are planted as lines of trees and buildings are dependent on one another for effect. Foresight in planting trees.

(*j*) Sufficient areas have been provided for parks in the following places :— Parks.

(*a*) The Viceregal estate.

(*b*) The park-way from Indrapat to the Secretariats.

(*c*) The park round the Lodi tombs and Safdar Jang's Mausoleum.

(*d*) The park area to the south of the club containing the golf and race-course.

(*e*) The park between the new and the present city, roughly 1,000 yards in width.

(*f*) The afforested ridge.

(*k*) The lay-out has been designed within lines of deviation so as to give the greatest possible freedom, and provides for a city on a ten square mile basis : but the alignment of avenues and roads is equally suited to a restricted lay-out of the nature that was considered for the North Site. Reduced or extended lay-out.

(*l*) A lake which can be obtained by river treatment is shown on the plan. The lay-out has been made independent of the water effect, but the Committee think that its ultimate creation will enhance enormously the beauties and general amenities of the new capital : and it should and would become an integral portion of the design now submitted. Water effect.

6.—Recommendations in regard to the treatment of special points.

Having set forth the general idea underlying the plan of the town and given a general description of the lay-out, the Committee feel that, without any desire to tie the hands of those who are to build and develop the new city, there are certain points of important detail, chiefly connected with engineering problems, in connection with which they wish to make recommendations. Their remarks will fall under the heads of—

I.—Water-supply and irrigation.

II.—Storm water drainage.

III.—Sewage system and refuse destruction.

IV.—Communications—

(*a*) Railways.

(*b*) Roads—their construction and surfaces.

(*c*) Tramways.

(*d*) Diversion of traffic.

(*e*) Through traffic routes.

V.—Parks and open spaces.

VI.—Arboriculture.

VII.—River treatment and water effects.

VIII.—Future development.

A map of the Engineering services forms an enclosure to the report.

I.—WATER-SUPPLY AND IRRIGATION.

Necessity for ample water-supply.

1. A healthy and beautiful city in the vicinity of Delhi must depend very largely on the provision of an abundant water-supply for domestic, sanitary and irrigational purposes.

Sources of supply.

2. Several sources have been investigated and estimated for: these include :—

(*a*) The subsoil water.

(*b*) The Jumna river (by gravitation).

(*c*) The Jumna river locally (by pumping).

(*d*) The Western Jumna Canal.

Purposes for which water from different sources is suitable.

3. Of these sources (*a*), (*b*) and (*c*) could provide water suitable not only for irrigation but also for a domestic water-supply, while (*d*) could provide water only for irrigation; the pollution of the canal water renders it unfit for drinking purposes, except by having recourse to filtration at a prohibitive cost. This question was gone into very fully at the time of the investigations preliminary to the installation of the present Delhi domestic water-supply in the seventies.

Subsoil water sources.

4. From the records of the subsoil water available it is apparent that this source cannot be relied upon at present to provide water in sufficient quantities locally. Mr. Hayden, the head of the Geological Department of the Government of India, was consulted and held out no hope of any large quantity of water being obtainable from deep borings.

Trial deep boring suggested.

5. A trial deep boring is not, however, an expensive matter, bearing in mind the importance of this subject, and valuable information might be obtained by such an experiment.

Mr. Hayden has kindly promised, on completion of the surveys, to send down a geologist, who would give a final report on the possibilities of finding subsoil water in quantity. As the surveys have now been completed, this offer might be accepted. Such a report would decide once and for all the possibilities of getting water from the rock.

Source of the Jumna river in its higher reaches.

6. The Jumna river in its higher reaches has been investigated and a scheme prepared in outline for a lengthy pipe line capable of delivering sufficient water both for domestic and irrigation purposes by gravitation.

The Committee reluctantly came to the conclusion that the heavy initial cost of such a scheme and the maintenance of so lengthy a pipe line (considerably over 130 miles) must put this source of supply out of court, especially bearing in mind that a large proportion of the water is required not for domestic but for irrigation purposes.

Western Jumna Canal source.

7. The Delhi branch of the Western Jumna Canal, as at present operated for irrigation purposes in this neighbourhood, is of necessity closed for periods of from 10 to 20 days in each month, the water being during these periods utilized in other branches of the canal which do not supply the neighbourhood of Delhi. The main canal is also closed altogether occasionally for even longer periods, in order to carry out necessary repairs, or on account of a lack of demand on the part of the farmers. This source could not, therefore, be relied upon, unless a special channel giving a regular supply should prove possible and capable of economical construction.

In any case the level of supply would only provide for the flow irrigation of so much of the area as lies below the 705 contour, and it would still be necessary to pump all water required for land lying above this level.

Source of the Jumna river locally.

8. The best source of supply hitherto investigated is that from the river Jumna close above Delhi, and it is recommended that the domestic water supply for the new city should be obtained from this source.

As the conditions, connected with the supply of domestic water, differ from those relating to water for irrigation purposes, it has been found necessary to recommend pumping stations at separate situations.

9. For the purpose of domestic supply it is recommended that the pumping station and intake works should be at the northern end of the ridge above the village of Wazirabad. Upstream of this point for a number of miles there are no villages abutting directly on the river on either bank, and those existing in the neighbourhood of the river do not contain many inhabitants. Pollution from this source, therefore, need not be feared, if the population and their arrangements are subjected to inspection from time to time. It is understood that, should any fear of pollution arise, there would be no difficulty in arranging for the evacuation of such villages. Site for domestic water-supply pumping station recommended.

10. As at present arranged, the outfalls from the drainage of the Barari plain and the Najafgarh jhil drain might occasionally give cause for alarm; but these outfalls can quite easily be transferred to a point south of Wazirabad, where the line of a former mill race is still visible, passing under an old stone bridge near the mosque. This could be deepened and improved so as to provide a satisfactory outlet for these drains well down stream from the proposed intake; and in this way any reasonable cause for complaint would be avoided. Suggested alteration of outfalls of Barari plain and Najafgarh jhil drains.

It may be argued that the position of the present intake is quite satisfactory, but the fact that it is placed below the outlet from the Najafgarh jhil drain which forms the natural escape for a portion of the storm water coming from populated districts outside the city, and also for a certain amount of sewage from the same areas, is in itself an argument for placing the new source of domestic water-supply in such a position as to be above suspicion. It should not be forgotten also that the present suburb of Sabzi Mandi and the proposed extensions of the existing city will drain into the Najafgarh jhil cut. It is also quite possible that the land around the present intake of the waterworks may be utilised for building purposes.

11. From the pumping station it is proposed to deliver the water, after settlement and filtration, to a reservoir on the ridge somewhere near the point marked 865 feet west of Talkatora garden: the rising main will be utilized also for purposes of distribution, so that the reservoir may be used both for storage and for balancing purposes. Position of reservoir.

It is possible that a saving of permanent pumping head might be effected by siting the reservoir at some height lower than 865 feet, and the minimum height which will ensure efficient command should be investigated. In describing the lay-out a site was suggested at the western end of the main east to west axis where such a reservoir could be brought into effective relation with the main features of the design. This may be found feasible; but it should be borne in mind that the reservoir should be capable of delivering water all over the old city, as well as the new, so as to allow of a combined supply for both in the future from one system. This is a possibility which on grounds of efficiency and economy should not be overlooked.

12. Centrifugal pumps should be used for the low lift from the river, and pumps driven by engines of the direct triple expansion type for the high lift to the reservoir. Pumps recommended for use for domestic water-supply.

13. With regard to the supply of water for irrigation purposes probably the best point for the establishment of the pumping station will be in the neighbourhood of, and somewhat to the south of, Indrapat; but this matter is to some extent affected by the question as to whether a water effect is to be provided, as in that event a pumping station on the edge of the lake would not be likely to fit in with the architectural scheme. Site of pumping station for irrigation water-supply.

14. A better site from this point of view would be the Baoli of Ugar Sain to which a conduit from the river could be led. This arrangement would prove economical in rising main and pumping head. Alternative site of pumping station near Ugar Sain's Baoli.

15. It may here be noted that the creation of a water effect by damming the river would mean a saving in static head of pumping, and would also render it easier in practice to ensure a permanent flow in any such conduit as that above mentioned, or in any locality close to a riverside pumping station. The water, being impounded, would display no tendency to wander away from the intake, which might easily happen in the case of the river bed as at present existing. Without some form of river treatment considerable labour and supervision would be necessary to ensure a continuous supply. Some advantages gained by damming the river.

Position of reservoirs.

16. From the pumping station it is proposed to deliver the water through rising mains at a velocity of about 3 feet a second to two reservoirs situated at a level of 750 on the base of the ridge near the villages of Malcha and Kalali ka Bagh respectively. The reservoirs in the case of the irrigation water need not be covered.

Pumps.

17. Pumps driven by engines of the direct acting triple expansion type are recommended for the irrigation water supply.

Distribution.

18. Common methods of irrigation in India are by open earthen channels; but in this case the Committee are strongly of opinion that the distribution must in all cases be effected through cast iron pipes. Owing to the varying levels of the ground and the necessity for good finish and appearance in the streets and avenues, and for reasons of public health and economy of pumped water the use of open water carriers for the purposes of distribution must be avoided.

Rising mains to form portion of distributing system.

19. The rising mains should in each case form a portion of the distributing system so that the greatest economy both in the cost of pipes and pumping may be attained.

Scouring to be provided for.

20. Owing to the amount of fine silt which will at times be delivered, provision will have to be made in all pipes and reservoirs for the scouring out of deposits.

Necessity for high rate of supply in distribution over small areas.

21. In the design of the distribution pipes, it must be borne in mind that, where the share of a consumer is not large, it is essential to give him a high rate of supply for a short time, rather than a low rate of supply for 12 or 24 hours, as otherwise the water will not run sufficiently rapidly over the garden and inefficient irrigation will result.

Compensating water for the river from the Ganges Canal.

22. It is clear from records that the available supply in the river Jumna is liable to fall to a very low figure. The possibility of having to increase this supply should therefore be considered. At present when the minimum seasonal supply in the river Jumna falls below a certain standard at Okhla, the Agra Canal gets compensating water from the Ganges Canal by the Jani escape and the Hindan river cut. It is possible to carry this water direct from the Jani escape into the Jumna river. Compensating water could be provided by this method without detriment to the Agra Canal. The cost would be about £75,000.

II.—Storm water drainage.

Facilities afforded by the configuration of the site.

1. The area selected as the site for the new city is, at the present time, well provided with surface water drainage in the form of nullas or valleys, which take the surplus water from the ridge and the land surrounding their course and lead it down towards the main drainage valley of the district, which has an outfall into the River near Kilokri.

It is proposed to make use of these valleys for the purpose of storm water courses as far as possible; but in most cases it will be found necessary to regularize their direction so that they could work to the best advantage with the lay-out of the streets in their vicinity.

Run-off to be provided for.

2. Their sections will be designed to take a rainfall equal to 1-inch per hour from the ridge and the finished surfaces of carriage ways, and an average of ½ an inch from other areas such as compounds, open spaces, etc. Should the ridge be terraced to keep back the water for tree growing, the run-off in that case also may be reduced from 1″ to ½″.

Grading proposed.

3. With the object of reducing velocity to an average of 5 feet per second notched weirs will be provided at suitable situations and in this way the cost of stone pitching may be avoided except in the neighbourhood of closely built areas.

The storm water outfall at Kilokri.

4. Whilst it is recommended that the sewer outfall should be taken eastwards to the river below Indrapat, the storm water outfall should follow the existing natural nulla which enters the river under the Bara Pula Bridge near Kilokri. This nulla ultimately must be brought to a regular section and straightened where necessary.

III.—Sewage system and refuse destruction.

1. The natural surface gradients of the area proposed as the site of the new city are well arranged for the construction of a sewage system. It is proposed that the main branch sewers shall be laid in those streets which most nearly follow the valley lines where they travel eastwards from the base of the ridge, and ultimately join the main sewer which will be laid parallel to the outfall drainage valley leading from the neighbourhood of the old city southwards to a point opposite to Indrapat, where it will travel eastwards in the direction of the proposed irrigation farm area on the *Bela* south of Indrapat. Ample land of a suitable character for sewage disposal can be obtained to which both the sewage from the new city area and also that from the old city can be delivered without pumping. Facilities for economical water-borne sewage disposal presented by the site.

2. It will be seen that the proposed sewage disposal area lies below the recorded high flood mark of the river at this point; but as it is only flooded on rare occasions when most of the low-lying land in the neighbourhood is also under water, this does not in itself warrant the additional expenditure which would be incurred in providing the pumping plant necessary for raising the sewage to land beyond the reach of exceptional floods. Expense of pumping on to land above flood line not justifiable.

3. The area of land required for sewage disposal purposes on this finely divided soil should be based on an average of 5,000 gallons of sewage per day per acre. Rate per acre of sewage.

4. At the upper end of each branch sewer it will be necessary to provide automatic flushing chambers. Automatic flushing.

5. The ventilation of the sewers will best be provided for by surface ventilator gratings in manhole covers as most of the roads will be wide, and the areas not closely built upon. Ventilation of sewers.

When property is closely built over, or any manhole gives special cause for complaint, it will be possible to find a site where ventilators can be erected. Where these must be used, they should be made as inconspicuous as possible.

6. The question of maintenance of drains and sewers is one which gives rise to many disputes, sewers being usually maintainable by the public authority, whilst drains are maintainable at the cost of the owner directly. As, however, it is very desirable that everything in connection with old and new Delhi should be kept up in the most efficient manner, it is recommended that all drains and sewers within the new city without exception should be maintained at the cost of the public body. Their initial construction of course should be arranged for in accordance with regulations drafted so as to provide for this being carried out in the best possible manner. Drains as well as sewers should be maintained by the public authority.

7. The whole of the sewage without exception should be water-borne and the drainage from houses, buildings and compounds generally should be arranged on the separate system. The separate system alone should be used.

The roof water from the buildings, as well as all bath and other soiled water, should be taken into the house drains to assist in flushing the sewers.

8. The house drains will generally be laid to a gradient of 1 in 60 which even in large compounds enables an outfall to be given without requiring an undue depth of sewer. Disconnecting traps provided with fresh air inlets on the house side of the trap should in every case be fixed, and ventilator pipes must be provided at the upper end of each drain and carried to a safe distance above the eaves well clear of all openings communicating with the interior of the house. House drains.

9. The regular flushing of all house drains is a matter which should receive special attention. Periodical flushing of house drains.

In Liverpool all house drain connections throughout the city are flushed four times per annum free of charge and it is found that great benefit is derived from the systematic cleansing of all private drains in this way. It is also possible for any householder to have the whole of his house drain connections flushed at any time, apart from the periodic flushing, on payment of a small fee sufficient to cover the actual cost of such works.

10. It may be suggested that a refuse destructor should be erected for disposing of the refuse of the new city. The refuse, however, from such an area Refuse destruction.

will be found somewhat difficult to dispose of by burning as owing to the small proportion of combustible material, and the large proportion of vegetable and other damp matter, it will be difficult in working the destructor to maintain a high temperature in the cells. This will lead to complaints. It is better on the whole to dispose of refuse in new Delhi by removing it to the country in quick moving vehicles, and using it there for agricultural purposes.

IV.—Communications.

(*a*) *Railways.*

Existing station inconveniently situated.

1. The construction of the new capital at Delhi will necessitate the provision of additional railway facilities. The railway stations, as now situated, are badly placed for Delhi as it now exists, and are most inconveniently located to serve the area on which the new capital will be built, as well as the new cantonment and the anticipated expansion of the old Sadr Bazar and Paharganj.

Need of a complete scheme.

2. It is imperative that a complete scheme of railway arrangements designed to serve the whole of the capital, both old and new, should be an essential feature of the lay-out of the Imperial City and this important matter should not be left to be settled when it is too late to deal with it.

Scheme of development advocated.

3. There is no need to embark at once on the whole of the works ultimately required for the improvement of the existing railway facilities so as to give to the future Delhi the railway accommodation it will be entitled to; it will be only necessary to proceed with this construction *pari passu* with the building of the new city and the extensions and the development of the trade and passenger traffic.

The scheme of the Railway Board.

4. A scheme has been prepared by the Railway Board, with whom the Committee have been in close communication, and the Committee are thoroughly in accord with it as now formulated.

Existing Railway Stations.

5. The scheme is briefly this. At the present time the East Indian Railway Station is the main station for Delhi. It is situated at the extreme north of the town. The other stations are Rohilla Sarai, Kishangunge and Subzimundi situated on the outskirts of the town, and Delhi Sadr on the west side of old Delhi.

Broad gauge trains to and from Bombay have no access to Rohilla Sarai and Kishangunge. Trains to and from the East Indian and Rajputana-Malwa Railways have no access to the important station of Delhi Sadr.

Description of the proposed scheme.

6. The scheme as now drawn out provides for a new terminal station which will be situated in the centre of the area covered by old Delhi, its probable extensions, the new city and the cantonment.

Into this terminus it will be possible to run every passenger train which will arrive at Delhi, whether on the broad gauge or metre gauge.

By no other means except by such a terminal arrangement is it possible to give to Delhi as a whole the important advantage of a central station into which all trains will run and from which all trains will depart.

Diversion of the Agra-Delhi Chord line.

7. The scheme also provides for a short diversion of the existing Agra-Delhi Chord line. This will be necessary so as to enable the Great Indian Peninsula and Bombay, Baroda and Central Indian Railways to run into the terminal station, and it will be advisable and financially sound to make this diversion because it will serve the new cantonment and the area within which old Delhi is to extend, and give an access which they do not now possess to trains from the west to all the stations now existing in Delhi.

It has also another advantage inasmuch as it enables access to be given to a large joint interchange yard at Delhi for all the Railways centering there; this is a necessity for which they have been pressing for many years, but which up to the present time it has not been found feasible to meet owing to the difficulties of the numerous directions in which these Railways approach Delhi

The site of the terminal station.

8. With regard to the actual site for the terminal station it has been placed in a very central position on the main avenue from Government House to the

Jumma Musjid and will be a point where a number of important roads converge. At their junction round a large *place* will be located the principal shops, hotels and other important business establishments.

Need to foresee railway development and to provide land and cross communications.

9. In this connection the Committee are of opinion that the opportunity should not be missed of dealing with the area lying between the city walls and the suburbs of Sadr Bazar and Paharganj in a comprehensive manner which will guarantee to the railway the land necessary for much improved accommodation in this neighbourhood. This will in the future be a very important area from both the railway and the municipal point of view, and advantage should be taken of the changes to obtain much more efficient means of communication by road to and from the city across the line to those districts in which the natural expansion of the old city is most likely to take place, *i.e.*, to the west and south of the Sadr Bazar. Two main roads not less in width than 100 feet should also be provided between the Civil Lines and the site of the new city, one adjoining the city walls and connecting at its north end with the Rajpur road, and the other on the western side of the railway between the Mithai Bridge and the Paharganj suburb.

Station accommodation of good class required.

10. Besides its convenient proximity to the new city, the terminal station will be very centrally situated for a large proportion of the inhabitants of the present city and its extensions. An imposing building adequately equipped in such a place will do much to assist in the development and finish of this centre. For it must be remembered that wherever the new city may be placed, a new and important station will be necessary, and in any case a considerable expenditure will have to be incurred in bringing the railway accommodation of Delhi up to date. The traffic to and from the new city with its considerable permanent population, as well as the permanent population of the Cantonment are factors which will no doubt enable the railway authorities to justify the provision of first class accommodation for these centres as a necessary railway expenditure. It is incumbent on railway management more than on any other body perhaps to remember that a new capital is being created at Delhi. The terminal station will be the focal point of both the old city and the new, and will greatly influence the set of the population.

Small savings to the railway administration should not be effected at the cost of inconvenience to civic institutions.

11. There is one point on which the Committee would like to lay stress. Considerable care must be exercised by those, who have the ultimate power of control, that the railways in the process of providing good accommodation are not allowed to interfere unduly with the equally important means of access and through communication by road between the different parts of the city and its suburbs.

Railways seriously sever such communication unless kept low enough to prevent the necessity for unsightly bridges, which with their sloping approaches are often exceedingly expensive to construct and require very careful design. It is often found that savings which are comparatively small to the railway company involve very costly street improvements when the time comes to deal with through roads and means of communications.

(*b*) *Roads, their construction and surfaces.*

General requirements.

1. The proper proportion and arrangement of road surfaces to meet the particular requirements of any district is always difficult. In new roads, where the amount of traffic is not likely to be large, economy and appearance are both likely to be served by keeping down the width of wearing surface to a minimum, and by seeing that levels are accurately worked to, and that the quality of the materials and finish of the workmanship, particularly in the lines of curbs, are equal to the best British standard.

Carriage way surfaces.

2. The carriage way surface should in every case in this new city be finished in an impervious material of the cheaper asphaltic character now much used in England on roads of the best class These materials consist principally of local macadam, or other broken stone, bound together by an asphaltic mixture which fills the interstices in the finished road, and leaves the surface impervious to water. The Committee strongly recommend that experiments be made with some selected specifications, notes of which have been given to the Chief Engineer, with the object of ascertaining by practical experience the most suitable mixtures for the locality.

When new roads are being constructed with water-proof surfaces, it will generally be found advisable not to finish the asphaltic surface until the road foundations and filling has had time for consolidation under traffic. Repairs and patches due to sinkages or other causes are much more noticeable in water-proof surfaces.

The use of kankar or other water-bound macadam, though undoubtedly the cheapest road surface material locally obtainable, cannot be recommended for use in the new city because of the necessity for frequent repairs and the cost of watering. Watering will in the case of kankar be absolutely necessary if the serious dust nuisance so prevalent in this country is to be obviated.

Dust nuisance.

3. Steps should be taken in connection with all roads and other open space surfaces to trap and retain dust as much as possible, and it is thought that this object might be assisted by the lowering of the grass margin adjoining roadways and footways a little below the neighbouring surfaces. If these grass areas could also be so levelled and arranged as to permit of their being occasionally covered completely by water, when being irrigated, the dust might be trapped permanently and added to the soil. It is also to be remarked that with wide grass strips and lines of well-irrigated trees, the amount of heat radiated from the road surfaces can be much reduced.

Surface drainage.

4. Many roadways are completely spoiled in appearance by the irregularity and unkempt condition of the nullas or surface water drains usually provided along the sides of the roads. In the new capital all deep open surface water drains should be avoided. In England it is customary to provide underground pipes for the removal of water from road surfaces. Where open side drains cannot be arranged outside the limit of the road, this course should be adopted, an outfall being given to the nearest surface water nulla.

Tar spraying and tar macadam.

5. Tar spraying the surface of roads already constructed in ordinary water-bound macadam is largely used in England at the present time as a means of improving the surface and reducing the dust nuisance, and gives satisfactory results. This can, therefore, be strongly recommended as a palliative in such cases. It is however expensive, and in India would probably cost two pence per square yard for each dressing. In many roads it is necessary to treat the surfaces once every year; where this is the case, it becomes cheaper, especially where new work has to be laid, to utilize bituminous materials in construction as in this way better surfaces are obtained.

Grading of roads.

6. With regard to the grading of the more important avenues and roads, it will be necessary in the interest of appearance to disregard the smaller irregularities of the existing ground, and to carry them through between important points and intersections in easy lines and gradients. Wherever possible it is desirable that convex surfaces in longitudinal section should be avoided, but where owing to the nature of the ground this is impossible, the alteration of level should be marked by a change of direction in the road, or by the placing of a building or other feature on the summit.

Cross sections.

7. The cross fall in roads having an asphaltic macadam surface should not exceed 1 in 48.

The plate at the end of this report illustrates the suggested cross-sections for a broad parkway and three typical avenues. In the case of the parkway and the 300 feet wide avenues, it is proposed to have an ornamental strip of water running through the broad grass plots. The level of the water in these channels will be below that of the roadways, the foot walks and the grass plots, so that they can be used for carrying off the surface water. The curbs at the edge of the water channels will be flush with the grass on either side; the result will be that should the channel overflow, the grass plots will themselves help to carry off the surface water.

It is understood that grass will not grow satisfactorily under well-grown trees, but as the trees will not be of a sufficient size to interfere with the growth of grass until they are about 15 years old, it is proposed to grow grass in the first instance under the young trees, and as soon as the trees interfere with the growth of grass, the strips of grass affected can be replaced by gravel or other suitable material.

8. The most satisfactory method of lighting the roads will be by lamps suspended across the roadways between columns, which shou'd be concealed as much as possible by being erected out of the way in the lines of trees. Lighting.

(*c*) *Tramways.*

The Committee have not suggested any tramway routes through the new city, as they are of opinion that the conditions of traffic would not be likely to give a satisfactory return. It has to be borne in mind that in the summer months the resident population will be small, and that in any case many of the residents will utilize their own means of conveyance.

Should a necessity for public means of conveyance arise it will probably best be met by the provision of a motor omnibus service, as in this way capital expenditure on tramway lines would be avoided, and there wou'd be no difficulty in laying up the omnibuses at those seasons when the traffic did not warrant their operations. If, however, a demand for tramways arises in the future, the roads are of ample width to accommodate them.

(*d*) *Diversion of traffic.*

There are three existing main roads through the site :—

(*a*) The road from Delhi to Gurgaon *viâ* Malcha.

(*b*) The road from Delhi to the Kutb *viâ* Safdar Jang.

(*c*) The road from Delhi to Muttra.

With regard to the interference with the traffic on these three roads the Committee consider that the Gurgaon road can be diverted without inconvenience so as to follow a line lying parallel to, and near the base of, the Ridge. This alignment will lead the traffic almost direct to the neighbourhood of Paharganj, through which it has hitherto passed.

The traffic coming from the Kutb in the direction of Safdar Jang towards Delhi can be diverted near the latter in two directions. The first alternative will transfer it by a diversion running south of Arakpur Bagh Mochi and joining the same route which was proposed for the diversion of the Gurgaon road. The other route will be a diagonal connection with the Muttra road. The traffic along the Muttra road may be allowed to continue towards the Delhi gate, light traffic entering the Delhi Gate and slower and heavier traffic the Turkoman gate.

(*e*) *Through traffic routes.*

The road communications through the new City and also those linking it to the old have been mentioned more than once. It will be seen by reference to the plan that they are numerous. The greatest pains must be taken to ensure, that, though they are not made too wide at first, no traffic possible in the future will ever congest them.

It is a mistake and uneconomical to make a roadway unnecessarily wide, but it is even a bigger blunder not to take such steps that the roadway can be widened cheaply when required. This can always be arranged by keeping back the frontages of buildings and all permanent structures.

With the newer and speedier methods of locomotion which are being introduced a free run is essential, for it will enable places many miles apart to be more easily accessible than others but a short distance away, but separated by a congested area. The delay and danger caused by cross traffic should be kept in mind, and there should be ample space where crowded roads intersect.

Nothing will conduce more to the convenience and the amenities of greater Delhi than facilities for locomotion across it in every direction.

V.—Parks and Open spaces.

Every effort must be made to ensure that the parks are a real feature. All over greater Delhi there is ample space for large parks and smaller recreation grounds of every description. Once trees have been planted and can be given a certain amount of water, some of these parks may be left for many

years in a wild state, requiring no costly upkeep, forming an area which will be dustless and pleasant to the eye and always available for expansion. The afforestation of the southern ridge has been already referred to. As it proceeds, one of the arguments that have been so freely used of late that some of the site is barren rock will speedily disappear. But the northern ridge must be considered also, for as soon as the linking road has been carried out, the drive along the crest from the Cantonments and Malcha to Hindu Rao's House and the Flagstaff Tower will become popular. Arrangements are now being made to protect its slopes, and, when to an unsurpassed sentimental and historic interest are added fine trees and shrubs and flowers, few places should have a stronger attraction.

The Kudsia and Roshanara Gardens, and indeed all the amenities of the northern site should also be jealously preserved. The coming of the Government of India to Delhi should mean no loss but pure gain.

When dealing with the detailed lay-out of the area intended to be devoted to minor officials, etc., care should be taken to see that ample air space and playing grounds for children is provided in the vicinity of these residences. It is now customary elsewhere in well-laid out neighbourhoods where the houses are small in character, to provide areas of at least as much as one acre for every ten acres of gross land developed, and open spaces of this character should invariably be provided in the vicinity. The same rule might well be applied to other areas; and everywhere open spaces in this proportion would be found useful both for ornamental purposes and for extension in future.

This should be particularly remembered when it comes to dealing with the western extensions of the Indian City and the quarters of the large railway staff which will be housed near the railway yards. In nearly all countries a feeling appears to prevail that the yards must be so big, so ugly and so smoky that nothing can be done to improve their amenities, and railway servants are prejudiced accordingly.

VI.—Arboriculture.

The Committee have already drawn attention to the time for planting trees, and the importance of determining the design of buildings, and the actual entrances to compounds before lines of trees are planted as the lines of trees and buildings are dependent on one another for effect. Another important point is the kind of trees to be used for avenues. As has been remarked before the size of the special trees selected for the avenues determine the width of avenues in which they are to stand. For the purpose of getting the right effect from the design of an avenue both the size and shape of trees are of importance; and with this end in view the Committee have picked out 13 kinds of avenue trees out of a very large number, which will grow in Delhi, and arrangements are being made to grow them in readiness to plant out on the avenues. A deviation from the kind of tree selected to suit each avenue means a loss of a large general effect. The Committee would therefore point out that the matter is one of considerable importance

In all countries there is a tendency to increase the number of trees and gardens in towns, and in Delhi, where trees give rest to the eye and assist in dissipating heat radiation and are quick in growth with irrigation, the afforestation of parks and compounds is likely to proceed apace. This must, however, advance on judicious lines and thought must be exercised to preserve lines of view, and not to conceal intended architectural effects The general tree effects in new Delhi, it may be safely anticipated, will be very fine: the danger is that they may be obtained to the elimination of nearly all other effects.

VII.—River treatment and water effect.

The scheme of river improvement and water treatment shown on the plan is intended to provide for an improved and healthier river frontage from Wazirabad to a point below Indrapat.

The river below the railway bridge would be trained towards the city walls by means of groynes on the east side until the channel becomes parallel to the walls, and remains at a distance of about 300 yards from them.

The *Bela* would be raised to a level above the permanent lake level, and given a fall for the drainage of the surface towards the river.

The east side of the river where the land is low could be raised by the deposits from flood waters and the edge could be embanked above high flood level and planted with trees.

As excavated material will be required in considerable quantities for raising the *Bela* and for filling and levelling areas within the new city site, an ornamental bay could be formed clear of the main channel of the river opposite to the end of the main avenue by excavation. This would be so arranged that the water of the river could be excluded at those times when it is heavily charged with silt.

The level of the water would be maintained by means of Stoney or other sluices below Indrapat in the line of the permanent channel, and the free passage of silt-laden storm waters as well as the removal of the silt deposited in the permanent channel during periods of small flow would thus be provided for.

Investigations show that a maximum level of R. L. 672 for water, whilst not sufficiently high to affect prejudicially the low-lying land on the west bank above Wazirabad, would reduce the total quantity of excavation over the shallow area required for the formation of the bay near Indrapat. If in working up the scheme the cost permits the water surface may be reduced to a minimum of R. L. 666; if this prove possible, this reduction in level will remove any subsoil water difficulties that may be urged against the scheme.

From the information available it appears likely that the present flow in the Jumna will meet the requirements of evaporation and percolation except during periods of exceptional low flow such as occurred during the month of June last year. On such occasions the water stored above the weir should be a very useful supplement to the Agra Canal supply, while the draining of the lake, should such a course become necessary, during the hottest portion of the year would not be unhealthy.

The improvement of the public health of the existing city of Delhi requires that the Bela should be raised and the river bed improved and made more permanent. Expenditure on these works if carried out as part of a larger scheme of general sanitary regeneration would help towards completion of this scheme also.

The total cost of this scheme including river training, excavation and deposit of material, provision of Stoney sluices, formation of roads and planting, it is considered, should not exceed £250,000.

The Committee are of opinion that the carrying out of the scheme outlined would be a great addition to the attraction of the new capital and they have, therefore, thought it well to include it in their plan as an important step towards the complete eventual development and embellishment of Delhi.

VIII.—Development and control.

The Committee have alluded to the case of Paharganj in paragraph 1 of their report. Before concluding their report, they would like again to draw attention to the advice offered in paragraph 10 of their former report on the choice of a site for the new Imperial capital. On that occasion certain recommendations were made for the acquisition of some lands for the extension of the present city of Delhi and the civil station, and for the control of other lands lying outside the limits both of the site of the new city and of these areas. In the former case the need is economic, civic and sanitary. Extensions there must be; and well-planned extensions fitting in with the scheme of communications which the Committee have delineated on their plan for the future complete development of the capital can now be obtained at a trifling expenditure on land acquisition. The environs of Delhi can now by such action be made a success. Left to themselves past experience would show that their regeneration and conversion into a sanitary and convenient suburb will at no distant date have become a crying need and one which it will be most expensive to effect.

In regard to control, the limits of the land now being acquired for the new city end near Safdar Jang's mausoleum. If the land beyond this remains uncon-

trolled it requires no great feat of imagination to predict that 50 years hence the expansion of the new capital in that direction may have become outflanked by the presence of numerous insanitary, but expensive, suburbs of the Paharganj type. The situation on the edge of the new cantonments and at the base of the new city is one where such a development might reasonably be expected to take place as a most ordinary expression of evolution.

7.—The newly appointed Committee who will carry out the construction.

The Committee esteem it as very fortunate that they have been in personal contact with most of the individual members of the newly appointed committee who will carry out the actual task of constructing Imperial Delhi; that one of their own members will work out in stone what for a year they have discussed on paper; and that so many of the officers, who have been associated with them, are re-engaged. They can therefore rely on continuity, and a carrying out of the ideas which they have endeavoured to express.

8.—Maps and Plans.

In the course of their deliberations many plans have been drawn.

With their first report, on the choice of a site, was printed a map explanatory of the gross areas which they considered the Government of India should purchase or control.

With their second special report, on the northern site, was issued a plan covering the whole of greater Delhi. The primary intention of this plan was to illustrate the position of possible northern and southern cities, but the Committee thought it also advisable to show on it the main through routes which they intended to recommend and which they relied on to ensure that nothing worthy of notice should be isolated, and that, however Delhi might expand, there should be channels of communication across it in every direction.

With this, their third report, they present their final plan or lay-out.

It should be looked at from two points of view. Where it deals with the new city which has to be built from its foundations, it embodies definite recommendations. All these lead up to a regularly formulated lay-out; but while some must be undertaken at once, as essential from the commencement, others will only become so as circumstances develop.

The Committee, however, hope that the Government of India will elaborate a policy by which these definite recommendations may eventually be carried out in their entirety.

But together with definite recommendations this Committee put forward suggestions. Without months of patient investigation into the conflicting interests and the value of the various properties which will be encountered it is impossible to lay down with any certainty the lines on which Delhi within the walls or the Sadar Bazar and other suburbs can be improved. The Committee are convinced that schemes for opening out are required combined with wide through traffic routes, and they have indicated certain roads. They hope that the Construction Committee will study these roads and endeavour to provide them; for it should never be forgotten that while compulsory improvements in crowded neighbourhoods are not only costly but unpopular, and moreover actually produce a more insanitary congestion—the tendency being for the dispossessed to huddle even closer into the side streets—on the other hand if easy access is given to fresh ground and better conditions, and traffic facilities are provided, it is possible to induce the people to move of their own free will. The Committee would point out that tempting people is more satisfactory than driving them. They also hope that in all their improvements the Construction Committee will bear in mind the paramount need for open spaces, not only for large parks but for small play grounds. These things are the essence of town planning.

A mass of notes, of tentative proposals and rough drawings, which have accumulated during the Committee's year of labour will be handed on for the information and the assistance of the Construction Committee.

9.—The help which the Committee have received.

It would be ungenerous of the Committee to close this report without placing on record their appreciation of the services of those who have assisted them. For seldom has such recognition been more thoroughly deserved. The circumstances were exceptional, for the Committee came from overseas and were very dependent on men with Indian training and local experience. They regret that they cannot acknowledge individually all the help which they have received not only from officials of every grade but from private persons—for assistance and useful criticism have come from many quarters, from Europeans and Indians alike. But they must mention by name those who have worked with them for a whole year. Mr. deMontmorency and Mr. Ward, both brought to the task an intimate acquaintance with the varying problems which have to be tackled. Their service has been most helpful to Delhi and quite invaluable to the Committee. Captain Roberts, Captain Sopwith, and Mr. Parker have laboured day in and day out to make the project a success.

The Committee trust that the Government of India will realize how much they owe to the loyal work of all these gentlemen.

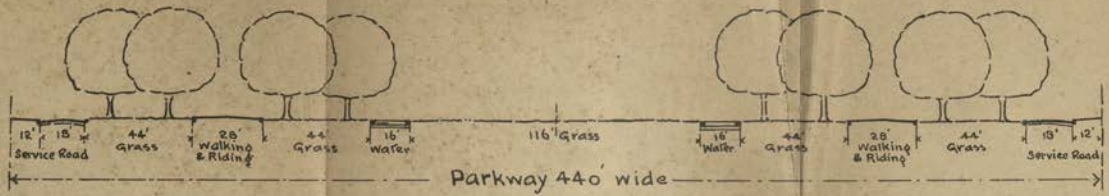
GEORGE S. C. SWINTON, *Chairman.*

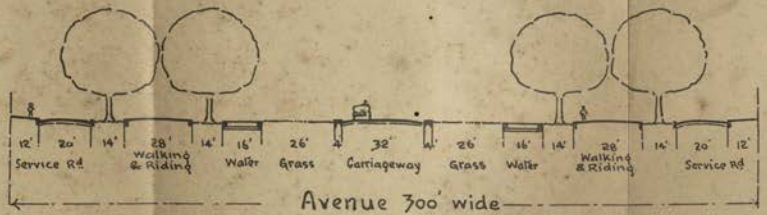
JOHN A. BRODIE,
EDWIN L. LUTYENS, } *Members.*

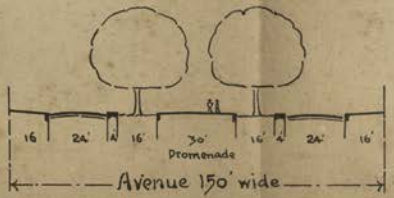
EXPERTS' CAMP, DELHI,
Dated 20th March 1913.

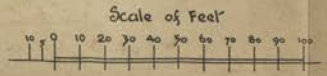
New Capital Delhi.

Typical Cross Sections of Avenues and Roads to accompany the Report of the Town Planning Committee.









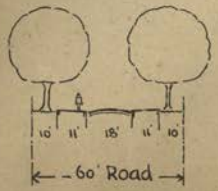


Photo.-Mech. and Litho. Dept., Thomason College, Roorkee.

Zinco. March, 1913.—No.-582-1000

ACCOMPANIMENT TO THE FINAL REPORT

OF THE

DELHI TOWN PLANNING COMMITTEE

ON THE

TOWN PLANNING OF THE

NEW IMPERIAL CAPITAL.

MAP OF THE LAYOUT OF AVENUES AND ROADS

TOGETHER WITH

ALIGNMENT OF MAIN SEWERS

AND OF

RISING MAINS FOR DRINKING AND IRRIGATION WATER.

LIBRARY OF THE BOMBAY BRANCH OF THE ROYAL ASIATIC SOCIETY

Scale four inches to a mile.

REFERENCES.

Arrangement of avenues and roads shewn in black.

Rising main for drinking water shewn in blue.

Rising main for irrigation water shewn in red.

Main sewers shewn in green.

Storm water courses will follow the valleys regularized so far as is necessary to work in with the streets.

Main outfall is by the natural channel that enters the river near Kilokri.

Season 1912.

DELHI

Mean Magnetic Declination 2°-14' East in 1912 (Decreasing by 1' annually).

Specially prepared for the Home Department from the Delhi and Hissar Revenue Surveys, 1870—72, revised in 1912, under the direction of Colonel S. G. Barrard, C.S.I., R.E., F.R.S., *Surveyor General of India*.

Origin of survey.

Nigdhu G. T. S. { λ. 20-50-25·5 / L. 76-44-19·34.

The High Flood Level 672·9 on E. I. Ry. bridge over the Jumna of 5th August 1908, is the maximum ever recorded. The H. F. L. 662·8 at Okhla is that for the flood of 19th September 1906; other H. F. L. values are for the flood of 14th August 1910, which approximates to the maximum recorded values at the E. I. Ry. bridge over the Jumna and at Okhla.

Contours are approximate.

Contours north of the chain line 6,650 and east of chain line 2,100, and contours north of Najafgarh Drain and Southern Punjab Ry. and East of the Jumna River have been inserted from information supplied by the Irrigation Dept., through Mr. Ward, C.I.E., M.V.O., Supdt., Engineer.

The heights cut on the canal standard bench-marks at Delhi, Shalars and Okhla require to have 2·13 feet, 1·45 feet and 1·27 feet subtracted from them respectively, to reduce them to the Survey of India terms given on this map.

The Water Level values refer to the water surface of the river pegged out on the morning of 26th April 1912.

Those portions of rivers, streams, canals, lakes, &c., which generally contain water are shown in blue.

IRRIGATION WATER ALTERNATIVE SITES FOR PUMPS A & B.

REFERENCES

CIVIL LINES
1 Telegraph Office 1857
2 No 1 Battery Right 1857
3 do Left
4 No 2 do Right
5 do Left
6 No 3 do
7 No 4 do

CITY
8 South where Gond Nicholson fell
9 Outer Sadr Gate
10 Tomb of Ghazi Khan
11 Rangi ki Masjid
12 Grave of Shah Turkaman
13 Kali Masjid
14 Grave of Rukiya Begam
15 Chori Qazar
16 Zinat ul Masjid
17 Sonahri Masjid
18 King Edward VII Memorial
19 John Tombs
20 Golden Mosque
21 Fatehpuri Masjid
22 Fatehpur Mosque

FORT
23 Naqqar Khana
24 Diwan i Aam
25 Moti Masjid
26 Diwan i Khas

SIGNED
GEORGE S. C. SWINTON, CHAIRMAN.
JOHN A. BRODIE, } MEMBERS.
EDWIN L. LUTYENS, }
20TH MARCH 1913.

ACCOMPANIMENT TO THE FINAL REPORT

OF THE

DELHI TOWN PLANNING COMMITTEE

ON THE

TOWN PLANNING OF THE NEW IMPERIAL CAPITAL.

MAP OF THE LAYOUT OF AVENUES AND ROADS.

Scale four inches to a mile.

NOTE.—Arrangement of avenues and roads shewn in black.

Season 1912.

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Origin of survey.

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REFERENCES

CIVIL LINES

1 Telegraph Office 1907
2 No 1 Battery Right 1907
3 do Left
4 No 2 do Right
5 do Left
6 No 3 do
7 No 4 do

CITY

9 Book where Geo Nicholson fell
9 Delhi Bade Rli
10 Tomb of Dilaji Khan
11 Sangi ki Masjid
12 Grave of Shah Turkoman
13 Kali Masjid
14 Grave of Ranjha Begum
15 Chob Qadar
16 Zinat ul Masjid
17 Sunderi Masjid
18 King Edward VII Memorial
19 Jain Temple
20 Golden Mosque
21 Tok Sunji Mosque
22 Fatehpuri Mosque

FORT

23 Naubat Khana
24 Diwan i Aam
25 Moti Masjid
26 Diwan i Khas

Key. No. 1908. G 12. M. C. 500.

Railways: 5'6 Gauge: Double Line. Single Line
Other Gauges: Double Line. Single Line
Electrical Lines and Tramways. Telegraph Line
Main Roads: Metalled, with Mile-stone. Unmetalled
Cart-track. Camel-track
Water: Masonry revet. with Depth of water. Ideal Contours
Temple. Mosque. Tomb. Sati. Idgah. Graves

Height-measurements at the Survey of India Offices, Calcutta.

Boundary: Province or State
Forest
Village
Limit of Cultivation
Trig. Station or Point. Spirit Levelled Bench Mark. Pir Gaib B.M. 255·28
Heights: Trigonometrical. Spirit Levelled. Positive. 749 705·2
Rock Outcrop

SIGNED
GEORGE S. C. SWINTON, CHAIRMAN.
JOHN A. BRODIE, } MEMBERS.
EDWIN L. LUTYENS.

20th MARCH 1913.

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